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Medical Essays

AND

OBSERVATIONS.

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Medical

Medical Eſſays

AND

OBSERVATIONS.

ARTICLE I.

The Meteorological Regiſter.

FOR underſtanding the following Obſervations, and comparing them with others, it is neceſſary to know the Form and Situation of the Inſtruments with which they were made, which are deſcribed in *Art.* II. of *Vol.* I.

JUNE 1734.

D.	Hour.	Baro. In.	D	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain. In.	D.
1	9 a. m.	29	7	12	8	3	0	N. E.	0	Cloudy -	0,988	
	5 p. m.	29	7	13	1	2	1	E.	1	cloudy		
2	9 a. m.	29	7	13	4	2	2	S. E.	0	Rain - -	0,084	
	6 p. m.	29	7	12	6	2	7	E. b. S.	0	Rain		
3	9 a. m.	29	7	13	5	2	0	S. W.	1	fair -	0,135	
	5 p. m.	29	7	14	0	1	5	W.	1	fair		
4	9 a. m.	29	8	13	6	1	6	W.	0	fair - -	0,075	
	6 p. m.	29	8	14	9	1	4	W.	1	fair		
5	8 a. m.	29	8	12	7	2	0	N.	0	fair - -	0,056	
	7 p. m.	29	9	13	6	1	6	N. E.	0	cloudy		
6	9 a. m.	29	9	12	4	1	8	E.	2	cloudy		
	7 p. m.	29	8	12	5	1	5	E.	2	cloudy		
7	9 a. m.	29	8	11	9	1	4	N. E.	2	fair - -	0,044	
	5 p. m.	29	8	12	9	1	3	E.	1	fair		
8	9 a. m.	29	9	12	3	1	5	E.	2	fair		
	7 p. m.	29	9	12	1	1	5	E.	2	fair		
9	9 a. m.	29	9	13	1	1	4	E.	1	fair		
	9 p. m.	29	9	12	6	1	4	E.	1	cloudy		
10	9 a. m.	30	0	13	2	1	4	E.	2	fair		
	5 p. m.	30	0	13	1	1	4	E.	2	cloudy		
11	9 a. m.	30	0	13	0	1	5	S. E.	0	cloudy		
	5 p. m.	30	0	14	1	1	6	S. E.	0	fair		
12	9 a. m.	30	0	14	8	1	5	N. W.	1	fair		
	5 p. m.	30	0	15	7	1	3	N. W.	1	fair		
13	9 a. m.	29	9	14	5	1	7	E.	0	fair		
	7 p. m.	29	9	14	8	1	5	E.	1	fair		
14	9 a. m.	29	9	13	2	2	2	N. E.	3	fair		
	5 p. m.	29	8	13	2	1	9	N. E.	2	fair		
15	9 a. m.	29	7	12	7	2	7	N. E.	2	cloudy		
	8 p. m.	29	7	12	8	2	8	N. E.	2	fair		
16	9 a. m.	29	7	13	7	1	6	N. E.	2	fair		
	5 p. m.	29	8	13	6	1	7	N. E.	2	cloudy		
											1,382	

JUNE 1734.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain
											1,382
17	9 a. m.	29	9	12	9	1	9	N. E.	2	Cloudy -	0,035
	8 p. m.	29	9	14	1	1	7	N. E.	2	fair	
18	9 a. m.	30	0	15	0	1	8	S. E.	1	fair	
	6 p. m.	30	0	16	5	1	3	S.	1	fair	
19	8 a. m.	30	0	16	8	1	4	S.	0	fair	
	6 p. m.	29	9	17	4	1	3	S. E.	2	fair	
20	9 a. m.	29	8	15	2	1	4	S. E.	1	fair	
	7 p. m.	29	8	15	6	1	2	S. E.	1	fair	
21	9 a. m.	29	8	14	3	2	0	N. E.	2	fair	
	7 p. m.	29	7	13	7	2	5	N. E.	2	Fog	
22	9 a. m.	29	7	14	8	3	1	N. W.	1	cloudy	
	8 p. m.	29	7	14	6	2	0	S. W.	0	fair	
23	9 a. m.	29	7	13	6	3	0	N. E.	2	Fog - -	0,455
	8 p. m.	29	7	12	7	3	2	N. E.	2	Fog	
24	9 a. m.	29	7	12	2	3	7	N. E.	3	cloudy -	0,234
	6 p. m.	29	7	12	1	3	3	N. E.	1	cloudy	
25	9 a. m.	29	6	13	1	3	0	E.	0	cloudy -	0,035
	6 p. m.	29	6	13	9	2	6	E.	0	fair	
26	9 a. m.	29	6	13	9	2	3	W.	1	fair	
	8 p. m.	29	7	14	7	1	7	W.	1	fair	
27	9 a. m.	29	8	14	4	1	8	W.	1	fair	
	8 p. m.	29	8	15	0	1	5	W.	1	fair	
28	9 a. m.	29	8	14	6	1	4	W.	2	fair - -	0,044
	7 p. m.	29	9	14	8	1	3	W.	2	fair	
29	9 a. m.	29	9	14	7	1	5	W.	2	fair	
	6 p. m.	29	9	15	6	1	2	W.	1	fair	
30	9 a. m.	29	7	14	3	1	7	S.	1	cloudy -	0,025
	7 p. m.	29	5	14	4	1	8	S.	1	cloudy	
H. at a med.		29	8	13	8	1	8			Total Depth	2,210
Gr. Height		30	0	17	4	3	7				
L. Height		29	5	10	1	1	2				

JULY 1734.

D.	Hour.	Baro. In.	D'	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain. In.	D.
1	9 a. m.	29	6	13	3	1	8	W.	3	Fair		
	7 p. m.	29	6	14	2	1	5	W.	3	fair		
2	9 a. m.	29	6	13	3	1	6	W.	3	fair		
	8 p. m.	29	7	13	5	1	7	N. W.	2	fair		
3	9 a. m.	29	9	14	6	1	5	N.	1	fair - -	0,050	
	6 p. m.	30	0	14	5	1	5	N. E.	1	fair		
4	9 a. m.	30	1	14	4	1	4	N. E.	2	fair		
	7 p. m.	30	1	14	7	1	3	N.	1	fair		
5	9 a. m.	30	1	15	4	1	3	N.	0	fair		
	7 p. m.	30	1	15	4	1	3	N. W.	1	fair		
6	9 a. m.	30	1	14	6	1	5	W.	1	fair		
	8 p. m.	30	1	14	8	1	3	W.	1	fair		
7	9 a. m.	30	0	14	5	1	8	E.	1	cloudy		
	5 p. m.	30	0	14	6	1	4	E.	1	fair		
8	9 a. m.	30	1	14	6	1	7	E.	1	fair -	0,114	
	7 p. m.	30	1	15	0	1	4	E.	1	fair		
9	9 a. m.	30	0	15	6	1	6	S. E.	1	fair - -	0,056	
	5 p. m.	30	0	15	3	1	5	S. E.	1	fair		
10	9 a. m.	30	0	15	3	1	8	N. W.	1	cloudy		
	5 p. m.	30	0	16	4	1	5	N. W.	1	fair		
11	9 a. m.	29	9	15	5	1	4	W.	2	cloudy		
	6 p. m.	29	9	15	4	1	4	S. W.	2	cloudy		
12	9 a. m.	29	7	15	3	1	4	W.	2	fair		
	7 p. m.	29	6	14	7	1	5	S. W.	1	Rain		
13	9 a. m.	29	4	14	6	1	7	S. W.	2	fair - -	0,074	
	7 p. m.	29	4	15	5	1	3	S. W.	2	fair		
14	9 a. m.	29	3	14	9	1	4	W.	2	cloudy		
	6 p. m.	29	3	13	12	0		N.	2	Rain		
15	9 a. m.	29	6	12	6	1	9	N. W.	1	cloudy		
	7 p. m.	29	7	13	6	1	3	N. W.	1	cloudy		
16	9 a. m.	29	5	14	6	1	8	S. W.	2	cloudy		
	6 p. m.	29	5	14	8	1	4	W.	2	cloudy		
											0,294	

JULY 1734.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain.
											0,294
17	9 a. m.	29	5	13	9	1	6	W.	1	Fair	
	5 p. m.	29	6	13	7	1	6	E.	1	cloudy	
18	9 a. m.	29	8	12	6	1	6	E.	2	fair - -	0,030
	6 p. m.	29	9	13	7	1	3	E.	2	fair	
19	9 a. m.	29	9	14	3	1	4	W.	2	fair	
	5 p. m.	29	8	15	3	1	2	S. W.	2	cloudy	
20	9 a. m.	29	6	13	7	1	5	W.	3	cloudy -	0,053
	6 p. m.	29	7	14	0	1	4	W.	3	cloudy	
21	9 a. m.	29	7	14	4	1	6	N. W.	2	cloudy	
	6 p. m.	29	7	14	6	1	6	N. W.	2	cloudy	
22	9 a. m.	29	9	14	7	1	8	W.	2	fair	
	7 p. m.	29	9	15	6	1	6	N. W.	2	fair	
23	9 a. m.	29	9	15	3	1	5	N. W.	2	fair	
	7 p. m.	29	9	16	5	1	5	W.	2	fair	
24	9 a. m.	29	8	16	0	1	9	N. b. W.	1	Fog	
	8 p. m.	29	8	15	3	1	6	N. W.	1	cloudy	
25	9 a. m.	29	8	15	6	1	6	W.	1	fair - -	0,190
	5 p. m.	29	8	15	0	1	7	W.	1	fair	
26	9 a. m.	29	5	15	1	2	6	S. E.	1	hazy -	0,020
	6 p. m.	29	5	15	0	1	9	S. E.	2	Rain	
27	9 a. m.	29	4	14	3	2	4	E.	2	Fog	
	6 p. m.	29	3	15	0	2	1	E.	1	cloudy	
28	9 a. m.	29	3	14	1	3	0	E.	1	Rain	
	6 p. m.	29	4	13	5	3	5	E.	1	Fog	
29	9 a. m.	29	5	13	7	3	8	E.	1	Fog - -	0,076
	8 p. m.	29	6	14	6	2	9	E.	0	cloudy	
30	9 a. m.	29	7	14	3	2	7	E.	2	fair	
	8 p. m.	29	8	14	1	2	5	E.	1	fair	
31	9 a. m.	29	8	13	6	2	7	E.	1	cloudy -	0,046
	5 p. m.	29	8	14	2	2	1	E.	1	cloudy	
H. at a med.		29	7	14	1	1	7			Total Depth	0,709
Gr. Height		30	1	16	5	3	8				
L. Height		29	3	12	6	1	2				

AUGUST 1734.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain. In.	D.
1	9 a. m.	29	7	13	7	2	6	W.	2	Cloudy		
	5 p. m.	29	8	14	3	2	7	E.	2	Rain		
2	9 a. m.	30	0	12	6	1	9	W. b. N.	2	fair - -	0,045	
	6 p. m.	30	0	14	2	1	5	N. W.	2	fair		
3	9 a. m.	30	0	13	0	1	8	N. W.	2	fair - -	0,090	
	5 p. m.	30	1	14	7	1	5	N. E.	2	fair		
4	9 a. m.	30	0	14	0	1	7	N. W.	2	fair - -	0,180	
	5 p. m.	29	9	15	6	1	5	W. b. N.	2	fair		
5	9 a. m.	29	9	14	4	2	3	N. W.	2	hazy		
	7 p. m.	29	8	14	5	2	2	W.	2	cloudy		
6	9 a. m.	29	8	14	9	1	6	W.	1	hazy - -	0,260	
	7 p. m.	29	9	14	6	1	6	W.	1	hazy		
7	9 a. m.	29	7	14	5	1	7	S. W.	2	cloudy		
	7 p. m.	29	7	14	4	1	9	W.	2	cloudy		
8	9 a. m.	29	7	13	5	1	7	W.	1	fair		
	7 p. m.	29	7	14	3	1	4	W.	1	fair		
9	9 a. m.	29	6	13	8	2	1	E.	1	hazy - -	0,340	
	7 p. m	29	5	14	7	2	6	E.	1	Fog		
10	9 a. m.	29	2	14	4	3	0	E.	1	hazy - -	0,115	
	7 p. m.	29	0	12	7	4	9	N.	1	Rain		
11	9 a. m.	29	1	12	5	3	0	W.	2	Rain		
	6 p. m.	29	2	12	9	2	5	W.	2	Rain		
12	9 a. m.	29	6	13	5	2	2	W.	2	fair		
	7 p. m.	29	7	13	6	1	8	W.	1	clear		
13	9 a m	29	7	13	3	2	0	W.	1	fair		
	7 p. m.	29	6	13	8	1	7	S. W.	1	fair		
14	9 a. m.	29	7	13	7	1	8	S. W.	1	fair		
	7 p. m.	29	6	14	0	1	6	S. S. W.	1	cloudy		
15	9 a. m.	29	6	13	9	2	0	S. W.	1	cloudy -	0,090	
	7 p. m.	29	6	14	3	1	5	W.	1	cloudy		
16	9 a. m.	29	6	13	7	1	8	W.	2	fair		
	7 p. m.	29	6	14	0	1	6	W.	1	fair		
											1,129	

AUGUST 1734.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind, Dir.	For.	Weather.	Rain.
											1,120
17	9 a. m.	29	7	13	5	2	0	N. E.	2	Fair	
	7 p. m.	29	7	13	7	1	8	N. E.	1	fair - -	0,050
18	9 a. m.	29	9	13	5	1	8	S. W.	1	fair	
	7 p. m.	29	8	13	6	1	7	S. W.	1	fair	
19	9 a. m.	29	7	13	7	1	6	W.	2	cloudy	
	7 p. m.	29	7	13	6	1	7	S. W.	2	fair	
20	9 a. m.	29	8	13	3	1	7	W. b. S.	2	fair	
	7 p. m.	29	9	12	7	1	5	W.	1	fair	
21	9 a. m.	30	1	12	8	1	7	W.	1	fair	
	7 p. m.	30	1	13	6	1	7	E.	1	cloudy	
22	9 a. m.	29	9	13	7	1	9	S. E.	2	cloudy	
	7 p. m.	29	8	13	6	1	9	S. b. E.	1	Rain	
23	9 a. m.	29	6	14	0	2	5	S. E.	1	Rain	
	7 p. m.	29	4	14	4	2	1	S. W.	1	Rain	
24											
25	9 a. m.	29	5	13	8	1	9	W.	2	fair - -	0,060
	6 p. m.	29	5	14	4	1	5	W. b. S.	2	fair	
26	9 a. m.	29	3	14	8	1	7	W. b. S.	3	clear -	0,020
	7 p. m.	29	4	13	1	1	8	W.	3	clear	
27	9 a. m.	29	7	13	5	1	9	W.	3	cloudy	
	7 p. m.	29	7	13	2	1	8	W.	1	cloudy	
28	9 a. m.	29	8	13	5	2	1	W.	1	fair	
	7 p. m.	29	7	13	0	1	9	E.	1	Rain	
29	9 a. m.	29	4	12	7	2	7	S. E.	2	Rain	
	7 p. m.	29	4	13	8	1	5	E. b. S.	1	cloudy	
30	9 a. m.	28	9	13	3	2	1	S. W.	1	fair - -	0,035
	7 p. m.	28	8	13	1	1	8	S. W.	1	cloudy	
31	9 a. m.	28	7	13	8	1	9	S. W.	1	fair	
	7 p. m.	28	8	13	9	1	9	S. W.	2	cloudy	
H. at a med.		29	6	13	3	1	9			Total Depth	1,285
G. Height		30	1	15	6	4	9				
L. Height		28	7	12	5	1	4				

SEPTEMBER 1734.

D.	Hour.	Baro. In. D.	Ther. In. D.	Hyg. I. D.	Wind. Dir. For.	Weather.	Rain. In. D.
1	9 a. m.	28 9	13 3	1 9	W. 2	Fair - -	0,025
	7 p. m.	29 2	12 0	1 9	W. 2	fair	
2	9 a. m.	29 4	12 7	1 8	W. 3	fair	
	7 p. m.	28 9	11 8	1 2	W. 3	Rain	
3	9 a. m.	28 9	11 8	1 7	W. 3	fair	
	6 p. m.	28 9	12 3	1 6	S. W. 3	fair	
4	9 a. m.	29 3	12 7	1 5	N. W. 3	fair - -	0,078
	5 p. m.	29 5	13 0	1 5	N. W. 2	fair	
5	9 a. m.	29 6	12 9	2 3	W. 1	cloudy	
	5 p. m.	29 7	12 8	2 1	W. 1	fair	
6	9 a. m.	29 8	12 8	1 9	S. E. 2	cloudy	
	5 p. m.	29 7	12 7	1 7	W. 1	Rain	
7	9 a. m.	29 8	13 5	2 4	W. 2	fair	
	5 p. m.	29 9	12 7	1 6	W. 2	fair	
8	9 a. m.	29 9	12 5	1 9	S. W. 2	cloudy	
	5 p. m.	29 8	13 1	1 8	S. W. 1	cloudy	
9	9 a. m.	29 6	11 3	2 3	N. E. 2	Rain -	0,130
	5 p. m.	29 7	11 3	1 7	N. 2	fair	
10	9 a. m.	29 8	11 6	1 6	N. W. 2	fair - -	0,065
	6 p. m.	30 0	11 2	1 5	N. W. 2	fair	
11	9 a. m.	30 0	11 6	1 6	N. W. 1	cloudy	
	5 p. m.	30 0	12 5	1 7	W.b.S. 1	cloudy -	0,090
12	9 a. m.	30 0	12 3	1 8	S. W. 1	cloudy	
	5 p. m.	30 0	13 2	1 5	S. W. 1	cloudy	
13	9 a. m.	30 0	12 3	1 8	W. 1	fair	
	5 p. m.	29 9	12 5	1 6	W. 1	cloudy	
14	9 a. m.	29 8	11 7	1 9	W. 2	fair	
	5 p. m.	29 8	12 4	1 5	N. W. 2	fair	
15	9 a. m.	29 8	12 1	1 8	W. 2	cloudy	
	5 p. m.	29 8	12 8	1 9	W. 2	cloudy	
16	9 a. m.	29 8	12 1	2 0	W. 1	fair	0,156
	6 p. m.	29 9	12 1	1 7	W. 1	fair	
							0,544

SEPTEMBER 1734.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain.
											0,544
17	9 a. m.	29	9	12	8	1	8	S.	2	Cloudy	
	4 p. m.	29	9	14	4	1	7	S. W.	2	fair	
18	9 a. m.	30	0	13	8	1	9	S. W.	3	fair - -	0,260
	5 p. m.	30	0	14	1	1	7	S. W.	2	cloudy	
19	9 a. m.	30	0	12	5	1	9	W.	1	cloudy	
	5 p. m.	29	9	11	3	2	1	W.	1	cloudy	
20	9 a. m.	29	7	11	8	2	9	S. W.	1	fair - -	0,127
	5 p. m.	29	6	12	0	2	8	S. W.	1	cloudy	
21	9 a. m.	29	4	11	9	2	0	S. W.	1	fair	
	5 p. m.	29	2	11	9	1	8	S. W.	1	fair	
22	9 a. m.	28	7	10	7	1	9	W.	3	Rain	
	5 p. m.	28	8	11	9	1	9	W.	2	cloudy	
23	9 a. m.	29	4	11	2	1	7	N. W.	2	fair	
	4 p. m.	29	5	11	8	1	7	W.	1	Rain	
24	9 a. m.	29	3	11	5	2	2	N. W.	1	fair	
	4 p. m.	29	3	12	2	1	9	N.	1	cloudy	
25	9 a. m.	29	7	10	7	2	0	N.	2	fair - -	0,090
	5 p. m.	29	9	11	1	1	6	N.	2	fair	
26	9 a. m.	30	0	10	1	1	7	W. b. N.	2	cloudy -	0,035
	4 p. m.	29	9	11	0	1	8	W.	2	cloudy	
27	9 a. m.	29	8	12	0	2	6	N. E.	1	cloudy	
	5 p. m.	29	8	11	8	1	9	E. b. N.	1	cloudy	
28	9 a. m.	29	7	11	6	1	9	E.	1	fair	
	4 p. m.	29	7	12	2	1	7	E.	1	fair	
29	9 a. m.	29	7	11	6	1	8	W.	2	cloudy -	0,116
	5 p. m.	29	7	10	0	1	8	W.	2	cloudy	
30	9 a. m.	29	3	9	9	2	2	S. W.	3	Rain	
	4 p. m.	29	3	10	6	2	0	S. W.	1	cloudy	
H. at a med.		29	6	12	0	1	8			Total Depth	1,172
Gr. Height		30	0	14	4	2	9				
L. Height		28	7	9	9	1	2				

OCTOBER 1734.

D.	Hour.	Baro. In. D.	Ther. In. D.	Hyg. I. D.	Wind. Dir. For.	Weather.	Rain. In. D.
1	9 a. m.	28 8	12 4	2 2	S. W. 4	Rain	
	5 p. m.	28 8	11 0	2 0	S. W. 2	fair	
2	9 a. m.	28 8	11 4	1 9	S. W. 3	fair	
	4 p. m.	29 1	11 6	1 7	S. W. 2	fair	
3	9 a. m.	29 1	10 6	1 9	S. W. 1	Fog -	0,096
	5 p. m.	29 0	10 4	2 2	N. W. 0	cloudy	
4	9 a. m.	29 3	10 6	2 2	S. 0	fair	
	5 p. m.	29 4	11 2	2 1	S. 1	fair	
5	9 a. m.	29 5	11 2	2 3	N. 1	cloudy	
	4 p. m.	29 5	11 5	2 1	N. 0	cloudy	
6	9 a. m.	29 5	11 6	3 0	E. 1	Fog	
	4 p. m.	29 3	11 6	2 4	E. 1	cloudy -	0,107
7	9 a. m.	29 1	10 4	3 1	N. E. 1	Rain	
	4 p. m.	29 2	10 7	3 2	N. 2	lowring	0,037
8	9 a. m.	29 5	10 6	2 6	W. 2	cloudy	
	5 p. m.	29 5	10 5	1 8	W. 2	cloudy	
9	9 a. m.	29 4	10 5	2 2	W. 3	cloudy	
	4 p. m.	29 4	10 0	2 2	W. 2	cloudy	
10	9 a. m.	29 5	10 2	2 4	W. 3	fair	
	5 p. m.	29 6	10 4	2 0	S. W. 2	cloudy -	0,130
11	9 a. m.	29 5	10 3	2 3	S. 1	cloudy	
	4 p. m.	29 3	10 6	2 3	S. 2	Rain	
12	9 a. m.	29 1	9 9	2 3	S. 1	fair	
	4 p. m.	29 1	10 8	2 0	S. 1	fair	
13	9 a. m.	29 1	10 6	2 2	S. E. 1	fair	
	4 p. m.	29 2	11 0	1 9	N. E. 2	cloudy	
14	9 a. m.	29 5	10 3	3 0	N. 0	cloudy -	0,090
	5 p. m.	29 6	10 4	2 9	N. 0	fair	
15	9 a. m.	29 6	10 7	2 9	N. E. 0	fair - -	0,030
	4 p. m.	29 6	10 4	2 7	N. E. 1	cloudy	
16	9 a. m.	29 6	9 4	2 5	N. W. 2	fair - -	0,290
	5 p. m.	29 7	10 2	2 2	N. W. 2	fair	
							0,789

OCTOBER 1734.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain.
											0,780
17	9 a. m.	29	9	9	7	2	3	N. W.	2	Fair	
	4 p. m.	29	9	10	3	2	0	N. b. W.	1	fair	
18	9 a. m.	30	0	9	2	2	1	N. W.	1	fair	
	4 p. m.	29	9	10	6	2	0	N. W.	1	cloudy	
19	9 a. m.	30	0	9	5	2	0	N.	4	fair	
	5 p. m.	30	1	9	3	2	0	N. E.	2	fair	
20	9 a. m.	30	0	9	5	2	0	W.	2	cloudy	
	5 p. m.	30	0	9	2	1	9	W. b. N.	0	cloudy	0,075
21	9 a. m.	30	0	10	2	2	6	N. W.	1	hazy	
	4 p. m.	30	0	10	3	2	8	N. W.	1	cloudy	
22	9 a. m.	30	2	9	5	2	6	W.	1	fair	
	5 p. m.	30	2	10	0	2	4	W.	1	fair	
23	9 a. m.	30	1	10	0	2	6	W.	2	fair	
	4 p. m.	30	0	10	8	2	6	W.	2	cloudy	
24	9 a. m.	29	9	11	8	3	0	W.	2	Rain	
	4 p. m.	29	8	12	2	3	0	W. b. S.	1	cloudy	
25	9 a. m.	30	0	10	9	2	5	S. W.	3	cloudy	
	4 p. m.	29	9	11	5	2	8	S. W.	3	cloudy	
26	9 a. m.	29	8	11	3	2	0	N. W.	4	fair	0,179
	4 p. m.	29	7	11	0	1	9	N. W.	4	cloudy	
27	9 a. m.	29	7	9	5	1	8	N. W.	3	fair	0,094
	4 p. m.	29	8	9	3	1	6	N. W.	3	cloudy	
28	9 a. m.	29	8	9	0	1	7	N. W.	2	fair	0,055
	4 p. m.	29	8	9	8	1	6	N. W.	1	cloudy	
29	9 a. m.	29	5	9	3	2	2	S. W.	0	Fog	
	4 p. m.	29	4	9	4	2	3	S. W.	1	fair	
30	9 a. m.	29	5	9	3	2	3	S. W.	2	fair	0,085
	4 p. m.	29	6	9	8	2	0	S. W.	2	fair	
31	9 a. m.	29	4	10	9	2	1	S. W.	1	cloudy	0,053
	4 p. m.	29	3	11	5	2	0	S. E.	1	cloudy	
H. at a med.		29	5	10	3	2	2			Total Depth	1,321
Gr. Height		30	2	12	4	3	2				
L. Height		28	8	9	0	1	6				

NOVEMBER 1734.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain. In. D.
1	9 a. m.	29	7	9	3	2	0	S. W.	1	Fair	
	4 p. m.	29	9	10	4	2	0	S. W.	0	fair	
2	9 a. m.	30	0	10	3	2	1	S.	1	fair - -	0,130
	4 p. m.	30	0	10	7	2	0	S.	1	fair	
3	9 a. m.	29	8	11	6	2	1	S.	1	cloudy -	0,070
	4 p. m.	29	9	10	8	2	1	S.	1	fair	
4	9 a. m.	29	8	10	4	2	1	S.	1	cloudy	
	4 p. m.	29	7	10	6	2	0	S.	2	fair	
5	9 a. m.	29	8	10	4	2	1	S. W.	2	fair	
	4 p. m.	29	8	10	5	2	1	S. W.	2	fair	
6	9 a. m.	29	9	10	2	2	3	S. W.	1	cloudy	
	4 p. m.	29	9	10	6	2	1	S. b. W.	1	cloudy	
7	9 a. m.	29	8	10	6	2	0	S. W.	1	cloudy	
	4 p. m.	29	9	10	1	2	0	S. W.	1	fair	
8	9 a. m.	30	2	9	0	2	3	S. W.	1	Froſt	
	4 p. m.	30	2	9	0	2	2	S. W.	1	fair	
9	9 a. m.	30	2	9	1	2	5	S. W.	1	Miſt -	0,180
	4 p. m.	30	2	9	3	2	7	S. W.	1	fair	
10	9 a. m.	30	2	8	5	2	3	S. W.	1	Froſt fog	
	4 p. m.	30	2	8	6	2	2	S. W.	1	Froſt fair	0,075
11	9 a. m.	30	2	8	2	2	1	S. W.	1	fair	
	4 p. m.	30	2	8	2	2	1	S. W.	1	fair	
12	9 a. m.	30	2	7	9	2	2	S. W.	1	Froſt fog	0,094
	4 p. m.	30	3	8	3	2	1	S. W.	1	Froſt fair	
13	9 a. m	30	4	8	2	2	4	S. W.	1	Fog	
	4 p. m.	30	4	8	9	2	4	S. W.	1	cloudy	
14	9 a. m.	30	4	9	0	2	5	S. b. E.	1	Fog	
	4 p. m.	30	4	9	4	2	2	S. b. E.	1	Fog	
15	9 a. m.	30	4	9	5	2	1	S. E.	1	Fog	
	4 p. m.	30	4	9	8	2	0	S. E.	1	Fog	
16	9 a. m.	30	4	9	4	2	0	S. E.	1	cloudy	
	4 p. m.	30	3	9	2	2	0	S. W.	1	cloudy	
											0,549

NOVEMBER 1734.

D.	Hour.	Baro. In.	Baro. D.	Ther. In.	Ther. D.	Hyg. I.	Hyg. D.	Wind. Dir.	Wind. For.	Weather.	Rain.
											0,549
17	9 a. m.	30	2	9	2	2	0	W.	1	Cloudy -	0,144
	4 p. m.	30	2	9	1	2	0	W.	2	cloudy	
18	9 a. m.	30	1	8	1	2	3	W.	1	fair - -	0,090
	4 p. m.	30	0	8	9	2	2	W.	1	fair	
19	9 a. m.	29	9	9	2	2	5	S.	1	Fog	
	4 p. m.	29	9	9	4	2	3	S. b. E.	1	Fog	
20	9 a. m.	29	8	8	8	2	2	S. W.	1	Fog	
	4 p. m.	29	7	9	3	2	3	S. W.	1	Fog	
21	9 a. m.	29	7	8	7	2	3	W.	1	fair	
	4 p. m.	29	7	9	5	2	3	W.	1	cloudy	
22	9 a. m.	29	5	8	6	2	3	S. W.	2	fair -	0,385
	4 p. m.	29	5	8	5	2	2	W.	2	fair	
23	9 a. m.	29	4	7	8	2	2	W.	0	Fog	
	4 p. m.	29	3	8	5	2	3	S. E.	1	Fog	
24	9 a. m.	29	4	9	0	1	9	N. E.	2	cloudy -	0,130
	4 p. m.	29	5	9	0	1	6	N. E.	2	cloudy	
25	9 a. m.	29	7	8	1	2	6	S. E.	1	Snow	
	4 p. m.	29	8	8	6	2	2	S. E.	1	cloudy	
26	9 a. m.	29	9	8	3	2	4	N.	3	fair - -	0,150
	4 p. m.	30	0	7	9	2	0	N.	2	fair	
27	9 a. m.	30	2	7	7	2	0	W.	1	Froſt	
	4 p. m.	30	2	7	9	2	0	W.	1	Froſt	
28	9 a. m.	29	6	10	3	2	3	S. W.	3	Thaw -	0,090
	4 p. m.	29	7	11	2	1	6	S. W.	2	fair -	
29	9 a. m.	29	6	11	6	2	6	S.w.b.w.	2	fair - -	0,070
	4 p. m.	29	6	11	7	2	7	S.w.b.w.	2	cloudy	
30	9 a. m.	29	6	9	7	2	6	W.	2	fair	
	4 p. m.	29	5	10	5	2	3	W.	2	cloudy	
H. at a med.		29	9	9	3	2	1			Total Depth	1,608
Gr. Height		30	4	11	7	2	7				
L. Height		29	3	7	7	1	6				

DECEMBER 1734.

D.	Hour.	Baro. In. D.	Ther. In. D.	Hyg. I. D.	Wind. Dir. For.	Weather.	Rain. In. D.
1	9 a. m.	29 1	11 5	2 3	S. W. 3	Cloudy -	0,094
	4 p. m.	28 9	11 5	2 3	S. W. 2	cloudy	
2	9 a. m.	29 0	8 7	2 3	S. W. 2	fair - -	0,067
	4 p. m.	29 1	8 8	2 2	S. W. 2	fair	
3	9 a. m.	29 1	8 3	2 3	S. b. E. 2	fair	
	4 p. m.	29 1	8 8	2 3	S. b. E. 1	fair	
4	9 a. m.	29 2	8 0	2 4	S. 1	Fog - -	0,190
	4 p. m.	29 2	8 4	2 3	S. 1	cloudy	
5	9 a. m.	28 9	9 1	2 5	E. 2	Fog - -	0,050
	4 p. m.	28 9	9 5	2 8	E. 2	Rain	
6	9 a. m.	29 1	9 5	3 0	W. 2	cloudy	
	4 p. m.	29 2	9 7	3 0	W. 2	hazy	
7	9 a. m.	29 3	9 0	2 8	W. b. N. 2	fair -	0,090
	4 p. m.	29 5	8 8	2 5	N. W. 2	fair	
8	9 a. m.	29 4	9 0	2 6	S. W. 1	cloudy	
	4 p. m.	29 3	10 1	2 4	S. W. 2	cloudy	
9	9 a. m.	29 0	10 0	2 5	S. W. 2	fair	
	4 p. m.	29 2	9 6	2 4	S. W. 2	fair	
10	9 a. m.	29 3	8 9	2 3	S. 3	fair	
	4 p. m.	29 3	9 5	2 3	S. 2	fair	
11	9 a. m.	28 8	8 5	2 8	N. W. 3	cloudy -	0,156
	4 p. m.	29 0	8 8	2 3	N. W. 3	fair	
12	9 a. m.	29 2	9 3	2 4	S. 1	fair - -	0,060
	4 p. m.	29 1	9 2	2 3	S. 1	fair	
13	9 a. m.	28 6	9 4	3 0	S. E. 1	Fog	
	3 p. m.	28 6	9 4	2 8	S. E. 2	cloudy -	0,075
14	9 a. m.	28 0	9 1	2 6	S. 2	hazy	
	4 p. m.	28 0	9 1	2 3	S. 2	cloudy	
15	9 a. m.	28 3	9 3	2 2	N. E. 2	fair	
	4 p. m.	28 6	9 1	2 5	N. E. 2	Rain	
16	9 a. m.	29 0	8 4	2 3	W. b. N. 2	fair -	0,460
	4 p. m.	29 1	8 8	2 5	W. b. N. 2	fair	
							1,242

DECEMBER 1734.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather	Rain.
											1,242
17	9 a. m.	28	9	8	6	2	5	S. E.	1	Fog - -	0,205
	4 p. m.	28	9	9	0	2	5	S. E.	1	hazy	
18	9 a. m.	28	9	9	0	2	5	S. W.	2	cloudy -	0,240
	4 p. m.	28	9	8	9	2	3	S. W.	2	fair	
19	9 a. m.	29	0	9	5	2	3	S. W.	3	cloudy	
	4 p. m.	29	1	9	8	2	3	S. W.	3	fair	
20	9 a. m.	29	5	9	3	2	5	S. W.	2	fair	
	4 p. m.	29	6	9	2	2	5	S. W.	1	fair	
21	9 a. m.	29	6	8	6	2	3	S. W.	2	Fog,	
	4 p. m.	29	6	8	8	2	6	S. W.	2	cloudy	
22	9 a. m.	29	8	7	9	2	5	W.	1	fair	
	4 p. m.	29	8	8	5	2	6	W.	1	Fog	
23	9 a. m.	29	8	7	4	2	8	S. b. E.	2	fair	
	4p. m.	29	8	8	1	2	7	S. b. E.	1	Fog	
24	9 a. m.	29	6	10	6	2	7	S. W.	2	cloudy -	0,385
	4 p. m.	29	5	10	3	2	7	S. W.	2	cloudy	
25	9 a. m.	29	7	8	3	2	5	W.	2	fair - -	0,090
	4 p. m.	29	7	8	8	2	5	W.	2	fair	
26	9 a. m.	29	5	9	9	2	3	S. b. W.	4	cloudy	
	4 p. m.	29	1	10	7	2	3	S. b. W.	4	cloudy	
27	9 a. m.	29	3	9	2	2	2	S. b. W.	3	fair	
	4 p. m.	29	1	10	0	2	2	S. b. W.	3	cloudy	
28	9 a. m.	28	6	9	9	2	6	S. b. W.	2	fair	
	4 p. m.	28	9	10	2	2	0	W. b. N.	3	cloudy	
29	9 a. m.	29	0	8	8	2	2	S. b. E.	1	Fog - -	0,170
	4 p. m.	29	0	9	0	2	2	S. b. E.	1	cloudy	
30	9 a. m.	29	5	8	3	2	3	S. b. W.	1	fair	
	4 p. m.	29	8	9	0	1	9	S. b. W.	2	fair	
31	9 a. m.	29	6	9	6	2	1	S. W.	4	cloudy	
	4 p. m.	29	8	9	0	2	3	S. W.	2	cloudy	
H. at a med.		29	0	9	1	2	4			Total Depth	2,332
Gr. Height		29	8	11	5	3	0				
L. Height		28	0	7	4	1	9				

JANUARY 1735.

D.	Hour.	Baro. In. D.	Ther. In. D.	Hyg. I. D.	Wind. Dir. For.	Weather.	Rain. In. D.
1	9 a. m.	29 9	9 2	2 3	W. b. S. 2	Fair	
	4 p. m.	30 0	9 3	2 3	W. 2	fair	
2	9 a. m.	29 8	10 7	2 3	S. W. 4	cloudy -	0,147
	4 p. m.	29 6	11 5	2 3	S. W. 4	Rain	
3	9 a. m.	29 9	9 0	2 3	S. W. 3	fair	
	4 p. m.	29 9	9 7	2 3	W. 3	cloudy	
4	9 a. m.	30 2	9 0	2 3	W. 3	fair - -	0,096
	4 p. m.	30 2	10 5	2 2	S. W. 3	cloudy	
5	9 a. m.	30 0	11 1	2 6	S. b. W. 3	cloudy	
	4 p. m.	29 8	11 3	2 6	W. 4	cloudy	
6	9 a. m.	29 6	11 4	2 6	W. 3	cloudy	
	4 p. m.	29 3	11 6	2 4	S. W. 4	Rain	
7	9 a. m.	28 7	8 7	2 1	S. W. 4	fair	
	4 p. m.	28 6	9 1	2 2	W. 3	cloudy	
8	9 a. m.	28 4	8 3	2 3	S. 1	Fog	
	4 p. m.	28 2	8 5	2 3	N. 1	fair	
9	9 a. m.	28 4	8 3	2 7	W. 1	fair- -	0,195
	4 p. m.	28 6	8 4	2 6	W. 2	fair	
10	9 a. m.	28 9	7 8	2 5	W. 2	fair	
	4 p. m.	28 9	7 6	2 4	W. 1	Fog	
11	9 a. m.	28 9	8 8	2 5	E. 2	cloudy	
	4 p. m.	29 0	8 7	2 7	N. 2	cloudy	
12	9 a. m.	29 5	7 7	2 2	N. W. 2	fair -	0,540
	4 p. m.	29 5	8 0	2 0	N. W. 2	fair	
13	9 a. m.	29 3	7 9	2 0	S. 2	Snow - -	0,430
	4 p. m.	29 0	8 2	2 1	S. E. 3	cloudy	
14	9 a. m.	28 6	8 8	2 2	W. b. N. 4	cloudy	
	4 p. m.	28 7	8 5	2 0	W. b. N. 3	cloudy	
15	9 a. m.	29 1	9 1	2 2	W. 3	fair	
	4 p. m.	29 2	9 2	2 3	W. 2	fair	
16	9 a. m.	29 3	8 4	2 6	S. W. 2	fair	
	4 p. m.	29 3	8 6	2 5	W. 2	fair	
							1,408

JANUARY 1735.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain.
											1,408
17	9 a. m.	29	5	8	5	2	5	W.	2	Fair - -	0,290
	4 p. m.	29	5	9	3	2	3	W.	2	cloudy	
18	9 a. m.	29	2	9	8	2	5	S. W.	2	cloudy -	0,057
	4 p. m.	29	1	10	6	2	6	S. W.	2	cloudy	
19	9 a. m.	29	2	9	5	2	5	W.	2	cloudy	
	4 p. m.	29	3	9	5	2	5	N.	3	cloudy	
20	9 a. m.	29	7	8	7	2	3	N.	2	cloudy	
	4 p. m.	29	8	8	2	2	2	N.	2	fair	
21	9 a. m.	29	9	8	6	2	0	W. b. N.	2	fair -	0,250
	4 p. m.	29	8	8	7	2	0	S. W.	2	cloudy	
22	9 a. m.	29	8	8	1	2	3	W.	2	fair	
	4 p. m.	29	9	8	6	2	2	N.	2	fair	
23	9 a. m.	29	8	8	4	2	1	E.	2	Fog	
	4 p. m.	29	8	8	3	1	9	E.	2	cloudy	
24	9 a. m.	29	8	8	0	1	9	N. W.	2	fair - -	0,410
	4 p. m.	29	8	8	8	2	0	N. W.	2	fair	
25	9 a. m.	29	8	8	8	2	3	W.	2	cloudy -	0,160
	4 p. m.	30	1	8	6	1	9	W.	2	cloudy	
26	9 a. m.	30	0	9	7	2	6	W.	2	fair	
	4 p. m.	29	9	10	6	2	7	W.	2	cloudy	
27	9 a. m.	29	9	9	7	2	6	W.	2	fair - -	0,130
	5 p. m.	29	9	10	0	2	2	W.	2	fair	
28	9 a. m.	29	9	10	8	2	3	W.	3	cloudy	
	4 p. m.	30	2	9	6	2	5	E.	2	Rain	
29	9 a. m.	30	3	9	6	2	4	W.	2	cloudy	
	4 p. m.	30	2	10	1	2	4	W.	2	fair	
30	9 a. m.	30	2	9	9	2	8	W.	2	fair - -	0,290
	5 p. m.	30	1	10	4	2	5	W.	2	cloudy	
31	9 a. m.	30	2	9	7	3	0	W.	2	fair	
	4 p. m.	30	3	10	6	2	3	W.	2	fair	
H. at a med.		29	5	9	2	2	7			Total Depth	2,995
G. Height		30	3	11	6	3	0				
L. Height		28	2	7	6	1	9				

FEBRUARY 1735.

D.	Hour.	Baro. In. D.	Ther. In. D.	Hyg. I. D.	Wind. Dir. For.	Weather.	Rain. In. D.
1	9 a. m.	30 4	9 3	2 8	W. 1	Fair - -	0,094
	5 p. m.	30 4	10 4	2 4	W. 1	fair	
2	9 a. m.	30 4	8 9	2 6	W. 1	fair	
	4 p. m.	30 5	9 7	2 5	W. 1	cloudy	
3	9 a. m.	30 4	8 9	2 3	W. 2	cloudy -	0,165
	5 p. m.	30 3	8 8	2 2	W. 2	cloudy	
4	9 a. m.	30 2	8 9	2 5	W. 2	cloudy	
	5 p. m.	30 2	8 7	2 4	W. 2	cloudy	
5	9 a. m.	30 1	9 7	2 2	W. 3	fair - -	0,290
	5 p. m.	30 0	10 4	2 1	S. W. 2	cloudy	
6	9 a. m.	30 0	10 8	2 8	S. W. 2	cloudy	
	4 p. m.	29 9	10 6	2 2	S. W. 2	fair	
7	9 a. m.	29 6	10 3	2 1	S. W. 4	fair - -	0,460
	5 p. m.	29 5	11 5	2 2	S. W. 4	cloudy	
8	9 a. m.	29 5	12 4	2 3	S. W. 2	fair - -	0,195
	5 p. m.	29 5	12 1	2 2	S. W. 2	cloudy	
9	9 a. m.	29 6	10 5	2 4	S. W. 2	fair	
	5 p. m.	29 7	10 8	2 0	S. W. 2	cloudy	
10	9 a. m.	29 6	9 4	2 0	S. W. 3	fair	
	5 p. m.	29 5	10 2	2 1	S. W. 4	Rain	
11	9 a. m.	29 9	9 3	2 0	W. 2	fair	
	4 p. m.	30 0	10 5	1 8	W. b. N. 1	Fog	
12	9 a. m.	30 1	10 7	2 7	W. 1	cloudy -	0,315
	4 p. m.	30 0	11 3	2 2	W. 1	drifling	
13	9 a. m.	29 9	10 9	2 3	S. W. 1	cloudy -	0,070
	5 p. m.	29 8	10 8	2 1	W. 1	cloudy	
14	9 a. m.	29 7	10 6	2 2	S. W. 2	fair	
	5 p. m.	29 7	10 9	2 1	S. W. 2	fair	
15	9 a. m.	29 8	8 9	2 1	W. b. N. 2	fair	
	5 p. m.	29 9	9 2	1 8	W. b. N. 2	fair	
16	9 a. m.	30 0	9 6	2 3	S. W. 3	cloudy -	0,560
	4 p. m.	29 8	10 8	2 2	S. W. 3	cloudy	
							2,150

FEBRUARY 1735.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain.
											2,150
17	9 a. m.	29	5	9	8	2	2	S. W.	2	Fair	
	5 p. m.	29	4	9	5	2	3	W.	2	fair	
18	9 a. m.	29	3	8	7	2	3	N.	2	Snow	
	4 p. m.	29	3	9	4	2	⊙	N. E.	2	fair	
19	9 a. m.	29	4	8	5	2	2	N. E.	3	cloudy -	0,496
	4 p. m.	29	5	8	6	1	8	N. E.	3	fair	
20	9 a. m.	29	8	7	4	1	9	W.	2	fair - -	0,170
	5 p. m.	29	8	9	1	1	8	W.	2	fair	
21	9 a. m.	29	9	8	6	2	2	N. W.	2	fair	
	4 p. m.	29	9	9	2	1	8	N. W.	2	fair	
22	8 a. m.	29	7	8	7	1	8	S. W.	3	fair	
	5 p. m.	29	5	9	6	1	9	S. W.	3	fair	
23	9 a. m.	28	9	9	5	2	1	S. W.	4	cloudy	
	6 p. m.	28	9	9	8	1	9	S. W.	3	fair	
24	9 a. m.	28	9	9	3	2	2	S. W.	3	fair - -	0,296
	4 p. m.	28	8	9	5	2	0	S. W.	2	fair	
25	9 a. m.	28	9	9	2	2	4	W.	2	fair - -	0,100
	5 p. m.	29	2	9	2	1	8	W.	2	fair	
26	9 a. m.	29	4	9	5	2	2	W.	2	fair	
	5 p. m.	29	4	10	8	1	7	S. W.	2	fair	
27	9 a. m.	29	0	10	3	2	5	S. E.	2	drifling	
	5 p. m.	28	9	10	9	1	8	S. W.	2	fair	
28	9 a. m.	29	1	10	6	2	1	S.	2	cloudy -	0,295
	6 p. m.	29	2	10	6	1	9	S.	2	fair	
H. ata med.		29	7	9	0	2	1			Total Depth	3,507
Gr. Height		30	5	12	4	2	8				
L. Height		28	8	7	4	1	7				

MARCH 1735.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain. In.	D.
1	9 a. m.	29	2	10	4	2	1	S. W.	2	Fair -	0,180	
	5 p. m.	29	1	10	5	2	0	N. W.	2	cloudy		
2	9 a. m.	29	0	10	0	2	5	S. b. W.	2	fair		
	5 p. m.	29	1	10	6	2	6	S. E.	2	cloudy		
3	9 a. m.	29	2	9	8	2	5	S.	2	cloudy -	0,050	
	5 p. m.	29	1	10	4	2	2	W.	2	cloudy		
4	9 a. m.	29	2	9	8	2	2	S.	1	fair		
	5 p. m.	29	2	10	2	2	2	S.	1	cloudy		
5	9 a. m.	29	4	11	0	2	3	S. W.	2	fair		
	6 p. m.	29	5	11	3	2	0	S. W.	2	cloudy		
6	9 a. m.	29	5	11	0	2	2	W. b. N.	2	fair		
	5 p. m.	29	7	11	0	2	0	N. W.	2	fair		
7	9 a. m.	30	0	9	2	2	1	S. W.	2	fair		
	4 p. m.	30	1	10	7	2	1	E.	2	fair		
8	9 a. m.	30	1	9	8	3	0	S. E.	2	Fog		
	4 p. m.	30	1	10	6	2	8	S. E.	2	Fog		
9	9 a. m.	30	2	9	7	3	6	S. E.	2	Fog - -	0,190	
	6 p. m.	30	2	10	1	3	3	S. E.	2	Fog		
10	9 a. m.	30	1	9	6	3	4	S. E.	2	Fog -	0,170	
	6 p. m.	30	0	9	9	3	0	S. E.	2	Fog		
11	9 a. m.	29	9	9	0	3	0	N. E.	3	cloudy		
	5 p. m.	29	9	9	7	2	0	N. E.	3	fair		
12	9 a. m.	29	9	9	5	2	0	E.	1	Fog		
	6 p. m.	29	8	10	4	1	8	E.	1	Fog		
13	9 a. m.	29	7	9	6	1	9	S. E.	1	fair		
	5 p. m.	29	6	10	0	1	8	S. E.	1	fair		
14	9 a. m.	29	4	8	6	2	0	S. E.	2	fair - -	0,290	
	5 p. m.	29	3	10	5	1	8	S. E.	2	fair		
15	9 a. m.	29	2	9	3	1	2	S. E.	2	fair		
	5 p. m.	29	1	9	9	2	5	E.	2	cloudy		
16	9 a. m.	29	0	9	6	3	8	E.	3	Rain		
											0,880	

MARCH 1735.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain.
											0,880
17	9 a. m.	29	4	8	7	2	8	N. E.	3	Cloudy	
	5 p. m.	29	5	9	3	2	2	N. E.	3	Hail	
18	9 a. m.	29	7	8	5	2	2	N. E.	2	fair - -	0,450
	5 p. m.	29	8	9	3	1	9	W.	2	fair	
19	9 a. m.	29	8	9	4	2	0	N. W.	2	fair - -	0,270
	4 p. m.	29	8	9	6	1	8	N. W.	2	fair	
20	9 a. m.	30	0	8	5	2	3	N.	2	fair - -	0,165
	5 p. m.	30	0	9	8	2	0	N.	2	cloudy	
21	9 a. m.	30	1	9	3	2	1	W.	2	cloudy	
	5 p. m.	30	1	10	7	2	1	W.	2	fair	
22	9 a. m.	29	7	10	4	2	5	W.	2	Rain	
	5 p. m.	29	6	11	5	2	7	W.	2	drifling	
23	9 a. m.	29	6	11	5	3	2	W.	2	cloudy -	0,450
	5 p. m.	29	6	11	9	2	5	W.	2	Rain	
24	9 a. m.	29	4	11	4	2	8	N. W.	2	Rain	
	6 p. m.	29	3	10	3	3	1	N. W.	2	Rain	
25	9 a. m.	29	3	9	8	2	7	N. E.	2	cloudy	
	5 p. m.	29	2	9	9	2	2	N. E.	2	fair	
26	9 a. m.	29	1	10	0	2	5	N. E.	2	cloudy -	0,390
	5 p. m.	29	1	9	0	3	1	N. W.	2	Rain	
27	9 a. m.	29	3	9	6	3	0	W.	2	fair -	0,910
	5 p. m.	29	3	10	7	2	3	N. E.	2	fair	
28	9 a. m.	29	3	9	9	3	5	N. E.	2	Rain -	0,060
	6 p. m.	29	3	9	7	4	0	N. E.	3	Rain	
29	9 a. m.	29	2	10	0	3	3	N. W.	2	cloudy -	0,970
	5 p. m.	29	4	9	8	2	4	N. W.	2	fair	
30	9 a. m.	29	6	9	5	2	3	W.	2	fair - -	0,640
	6 p. m.	29	5	10	9	1	9	S.	1	cloudy	
31	9 a. m.	29	3	9	4	2	4	W.	1	cloudy -	0,190
	6 p. m.	29	4	10	8	2	0	W.	1	fair	
H. at a med.		29	3	9	9	2	4			Total Depth	5,375
Gr. Height		30	2	11	9	4	0				
L. Height		29	0	8	5	1	4				

APRIL 1735.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain. In.	D.
1	9 a. m.	29	5	10	2	2	3	W.	2	Fair		
	6 p. m.	29	6	11	7	1	9	N. E.	2	cloudy		
2	9 a. m.	29	7	11	8	2	0	S.	1	fair - -	0,085	
	5 p. m.	29	8	13	3	1	9	S.	1	fair		
3	9 a. m.	30	0	12	3	2	3	S. E.	2	fair - -	0,070	
	5 p. m.	30	0	13	0	1	7	S. E.	2	fair		
4	9 a. m.	30	1	10	7	2	4	S. E.	2	cloudy -	0,190	
	6 p. m.	30	1	10	5	2	1	E.	2	fair		
5	9 a. m.	30	1	10	3	2	9	E.	2	cloudy		
	6 p. m.	30	1	9	8	2	7	E.	2	cloudy		
6	9 a. m.	30	0	9	7	3	0	E.	2	Rain -	0,250	
	6 p. m.	30	0	10	1	3	2	E.	2	drifling		
7	9 a. m.	29	9	10	0	3	4	E.	2	Fog - -	0,060	
	6 p. m.	29	8	10	1	3	3	E.	2	Fog		
8	9 a. m.	29	7	10	5	3	2	E.	2	Rain		
	7 p. m.	29	6	10	8	2	9	E.	1	cloudy		
9	9 a. m.	29	4	11	6	2	9	E.	1	fair		
	6 p. m.	29	4	12	1	2	1	S.	1	cloudy		
10	9 a. m.	29	4	10	8	2	9	E.	2	cloudy		
	7 p. m.	29	3	10	2	4	1	E.	2	Fog		
11	9 a. m.	29	2	10	8	4	1	E. b. N.	2	Fog		
	6 p. m.	29	3	10	5	4	1	E. b. N.	2	Fog		
12	9 a. m.	29	4	11	9	3	9	S. W.	0	cloudy -	0,140	
	6 p. m.	29	5	11	5	3	1	W.	1	cloudy		
13	9 a. m	29	7	11	4	2	7	W.	2	fair -	0,050	
	7 p. m.	29	8	11	7	2	4	W.	2	fair		
14	9 a. m.	29	8	12	1	2	6	S.	0	cloudy		
	6 p. m.	29	6	12	7	2	5	S.	2	cloudy		
15	9 a. m.	29	6	12	0	2	5	W. b. S.	2	cloudy		
16	9 a. m.	30	0	11	4	2	0	W.	2	fair		
	6 p. m.	30	0	13	0	1	7	W.	2	fair		
											0,841	

APRIL 1735.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain.
											0,845
17	9 a. m.	29	7	12	9	2	1	S. b. E.	1	Fair	
	7 p. m.	29	6	12	5	2	0	S.	2	cloudy	
18	9 a. m.	29	6	11	9	2	0	S. W.	3	cloudy	
	6 p. m.	29	7	11	5	1	9	S. W.	2	cloudy	
19	9 a. m.	29	4	11	5	1	9	S. W.	3	cloudy -	0,110
20	9 a. m.	29	5	11	3	2	9	W.	3	cloudy -	0,030
	7 p. m.	29	4	11	7	2	0	W.	2	cloudy	
21	9 a. m.	29	2	11	8	2	4	W.	4	fair	
	7 p. m.	29	3	11	4	1	8	W.	3	fair	
22	9 a. m.	29	0	11	9	2	0	W.	3	cloudy	
	7 p. m.	29	0	11	2	2	0	W. b. N.	3	cloudy	
23	9 a. m	29	5	11	1	1	8	W. b. N.	2	fair	
	6 p. m.	29	6	12	1	1	7	W. b. N.	2	cloudy	
24	9 a. m.	29	7	13	1	1	9	S. W.	2	cloudy	
	7 p. m.	29	6	12	5	1	8	S. W.	2	cloudy	
25	9 a. m.	29	5	12	6	1	8	S. W.	2	fair - -	0,070
	7 p. m.	29	5	13	5	1	5	S. W.	1	fair	
26	9 a. m.	29	6	12	8	1	7	S. W.	1	fair - -	0,290
	6 p. m.	29	5	13	4	1	5	S. W.	2	fair	
27	9 a. m.	29	3	11	4	2	0	N. E.	2	Rain - -	0,090
	7 p. m.	29	3	10	8	2	7	N. E.	2	Fog	
28	9 a. m.	29	2	11	7	2	0	N. W.	2	cloudy	
	7 p. m.	29	3	12	0	1	9	N. W.	3	fair	
29	9 a. m.	29	5	11	6	1	9	S. W.	2	fair	
	7 p. m.	29	6	12	8	1	6	S. b. E.	1	fair	
30	9 a. m.	29	8	11	5	2	1	E. b. S.	2	fair - -	0,195
	6 p. m.	29	8	12	5	1	8	E.	2	fair	
H. at a med.		29	7	11	2	2	3			Total Depth	1,639
Gr. Height		30	1	13	5	4	1				
L. Height		29	0	9	7	1	5				

MAY 1735.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain. In.	D.
1	9 a. m.	29	9	12	7	1	9	S. W.	2	Cloudy -	0,020	
	8 p. m.	29	7	11	7	1	9	S. W.	2	cloudy		
2	9 a. m.	29	7	12	0	1	9	W. b. N.	2	fair		
	8 p. m.	29	7	11	2	1	6	W. b. N.	2	fair		
3	9 a. m.	29	6	11	4	1	6	W. b. N.	2	fair		
	7 p. m.	29	7	12	8	1	5	W. b. N.	2	fair		
4	9 a. m.	29	9	11	7	1	5	N.	2	cloudy		
	8 p. m.	29	9	11	6	1	5	N. E.	1	cloudy -	0,055	
5	9 a. m.	29	9	12	0	1	6	N. E.	2	fair		
	7 p. m.	29	9	11	7	1	5	N. E.	2	fair		
6	9 a. m.	29	9	12	3	1	5	W. b. N.	2	fair		
	5 p. m.	29	9	13	6	1	5	W.	2	fair		
	7 p. m.	29	9	12	5	1	7	N. W.	2	cloudy		
7	9 a. m.	30	0	12	5	1	5	N. W.	2	fair		
	7 p. m.	30	0	11	6	1	6	N. W.	2	fair		
8	9 a. m.	30	0	12	8	1	9	S. W.	3	cloudy		
	7 p. m.	30	0	12	7	1	6	W.	3	fair		
9	9 a. m.	30	0	13	2	2	0	W.	4	cloudy -	0,070	
	8 p. m.	29	9	11	8	1	5	W.	3	fair		
10	9 a. m.	29	9	12	3	1	3	N. W.	3	fair		
	8 p. m.	29	9	11	0	1	3	N. W.	3	fair		
11	9 a. m.	29	7	10	9	1	3	N. W.	3	fair		
	7 p. m.	29	5	9	5	1	9	N. W.	3	Rain		
12	9 a. m.	29	5	10	8	1	7	N. W.	2	cloudy		
	7 p. m.	29	6	10	2	1	4	N. W.	2	cloudy		
13	9 a. m.	29	6	11	7	1	2	N. W.	2	cloudy -	0,030	
	8 p. m.	29	7	10	6	1	2	N. W.	2	fair		
14	9 a. m.	29	6	11	6	1	4	N. W.	2	fair - -	0,190	
	8 p. m.	29	5	11	5	1	3	N. W.	1	cloudy		
15	9 a. m.	29	3	10	7	1	5	S. W.	3	fair		
	7 p. m.	29	2	11	2	1	1	S. W.	3	fair		
16	9 a. m.	29	4	11	6	1	4	W. b. S.	2	cloudy		
	7 p. m.	29	4	12	5	1	2	W. b. S.	2	cloudy		
											0,365	

MAY 1735.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain.
											0,365
17	9 a. m.	29	5	12	1	1	1	W.	2	Fair	
	7 p. m.	29	7	12	9	1	2	W.	2	fair	
18	9 a. m.	30	1	12	2	1	0	N. W.	2	fair - -	0,150
	7 p. m.	30	1	13	7	0	9	N. W.	1	fair	
19	9 a. m.	30	2	13	5	1	2	W.	2	cloudy	
	8 p. m.	30	2	14	3	1	0	S. W.	2	cloudy	
20	9 a. m.	30	0	13	7	1	4	S. W.	2	cloudy	
	8 p. m.	29	8	12	9	1	2	W.	2	fair	
21	9 a. m.	29	8	13	7	1	4	N. W.	2	fair	
	8 p. m.	29	8	12	5	1	3	N. W.	2	cloudy	
22	9 a. m.	29	6	11	9	1	6	N.	2	Rain	
	8 p. m.	29	7	12	6	1	8	N.	2	cloudy	
23	9 a. m.	29	9	11	0	2	0	N.	2	cloudy	
	7 p. m.	29	9	11	1	2	0	E. b. N.	2	Rain	
24	9 a. m.	29	9	11	1	2	0	N. E.	2	cloudy	
	8 p. m.	29	9	12	4	1	5	N. E.	2	fair	
25	9 a. m.	29	8	12	3	1	9	N. E.	1	cloudy	
26	9 a. m.	29	9	11	3	3	3	N. E.	2	Fog - -	0,100
	8 p. m.	29	9	11	0	2	1	N. E.	2	Rain	
27	9 a. m.	30	0	11	0	2	3	N. E.	2	fair	
	8 p. m.	30	1	11	9	2	3	N. E.	2	fair	
28	9 a. m.	30	2	12	2	2	3	E. b. N.	2	fair	
	8 p. m.	30	1	13	6	1	9	E. b. N.	1	fair	
29	9 a. m.	30	1	13	4	1	3	S. E.	1	fair - -	0,070
	8 p. m.	30	0	14	7	1	5	S. E.	2	fair	
30	9 a. m.	29	9	13	5	1	8	E.	2	cloudy	
	8 p. m.	29	8	14	1	1	6	E. b. N.	2	fair	
31	9 a. m.	29	7	12	4	2	5	E.	2	cloudy -	0,035
	8 p. m.	29	7	13	4	2	0	N. E.	1	fair	
H. at a med.		29	8	12	1	1	6			Total Depth	0,720
Gr. Height		30	2	14	7	3	3				
L. Height		29	2	9	5	0	9				

II. *An Account of the* DISEASES *that were most frequent last Year in* Edinburgh.

THE *Tertian Ague*, which we already mentioned to have begun in *March* 1734, continued till the warm Weather in *June* thereafter put an End to it.

In MAY, JUNE and JULY 1734, several Children in the Neighbourhood of *Edinburgh*, and some within the City, laboured under the *Tussis convulsiva*, *Hooping-cough*, or *Kink-cough*. In AUGUST more Children were attacked by it. It became more frequent in SEPTEMBER. In OCTOBER few Children in the Villages near *Edinburgh* escaped it, and it was frequent all Winter within the Town, several Adults being also seized with it. The Symptoms of the Sick were no other than what commonly attend this Disease.

The Method of Cure most commonly followed here was, to keep the Vessels empty enough, by the Evacuations of bleeding, vomiting, purging and Blisters, which did not seem so much to shorten the Disease, as to prevent its proving fatal; for notwithstanding the liberal Use of these Evacuations, the Disease frequently continued seve-

ſeveral Months: For moſt part however there was a ſenſible Remiſſion for ſome Days after blooding or purging, eſpecially when the Purgatives worked upwards too. Pectorals of the ſoft balſamick kind, and the moſt attenuant were alſo given, but with little or no good Effect. Opiates rather did hurt. A great many Specificks were likewiſe employed, but, ſo far as we could obſerve, with as little Succeſs, as the numerous Charms the good Women thought fit to make Uſe of.

Other *Coughs* were alſo rife, and difficult to remove through the Winter.

It is worthy of a Remark, that both common and convulſive Cough, after being milder in *January* 1735, ſuddenly became much worſe in the firſt Week of *February*, and continued ſo the greater Part of that Month, gradually decreaſing afterwards as the Spring and Summer advanced.

Rheumatick Pains and Stitches, ſome with, others without Fever, ſeemed to begin, continue and decreaſe with the Cough. Repeated Bloodings and antiphlogiſtick Purgatives, with diluent, cooling, attenuant Medicines, proved the moſt effectual Remedies.

Towards the End of SEPTEMBER, and in OCTOBER, many People were ſeized with

a *Dyſentery*, of which there were ſome Remains in this Place all Winter. It had the ordinary Symptoms of ſlight Fever, frequent Stools, for moſt part bloody and mucous, violent Gripes, and an almoſt conſtant *Teneſmus*.

This Diſeaſe was fatal to ſome, and very tedious in others, who neglected the Evacuations in the Beginning, and had too ſoon Recourſe to Opiates and Aſtringents.

Patients under the *Dyſentery* were generally bled, vomited with *Ipecacoanna*, and purged with *Rhubarb*, with Opiates ſometimes in the Intervals, and mild mucaginous Food and Drink. In ſome Caſes, where the ordinary Method failed, the *Vitrum Antimonii ceratum* was given with Succeſs.

In OCTOBER there were ſome Fevers of a bad kind, in which the Head was much affected, and the Pulſe low and ſunk. Such Sick could not bear blooding, and Bliſters did very little Service to them.

In FEBRUARY Agues began, increaſed in MARCH and APRIL, and then gradually went off; and at the ſame Time ſome remitting Fevers were obſerved.

In the End of *March*, and Beginning of *April* many Children were ſeized with a very *irregular Fever*, which ſeldom continued any Number of Hours in the ſame Way.

Way. They were sometimes hot, then turned cold. Their Pulse was now very quick, soon after became moderate. Sometimes they had difficult Breathing, Thirst, Purging, like the *Diarrhœa* in Teething; at other Times they were free of these Symptoms. Notwithstanding any Medicines that were given, the Disease continued about ten Days, and then terminated in a Cough, which remained some Time with most of them, and in others was very difficult to remove.

III. *An Extract from the publick Register of Burials in* Edinburgh.

1734.	Men.	Women.	Child.	Still-born.	Sum.
June - -	10	25	28	5	68
July - -	18	18	22	9	67
August - -	18	21	39	4	82
September	18	21	34	6	79
October -	28	34	39	4	105
November	24	35	41	5	105
December	27	36	51	4	118
1735.					
January	25	38	48	4	115
February	21	18	53	5	97
March -	25	37	61	6	129
April - -	17	21	53	3	94
May - -	13	29	46	2	90
Total	244	333	515	57	1149

IV. *The*

IV. *The good Success of opposite Caustick, and of a strong alterative Mercurial Medicine; by Dr.* EDWARD BARRY *Physician at* Cork, *and* F. R. S.

I Visited with Mr. *Osburne* and Mr. *Wilson*, two eminent Surgeons in this Place, a Gentleman of about forty five Years of Age, of a sober Life, and in a married State, who had a hard Tumor formed in the Coats of the *Testes*, which lightly adhered to the right Testicle, and extended to the *Epididymis*, and was then as large as a Turkey-egg. It came on him without any Cause which he could account for, and was equal to the Size of a Walnut when he first perceived it. He says it made this Progress in the Space of one Night.

Some Months before he came to Town, Emollients and Suppuratives were used, a Collection of *Pus* was suspected, and a Puncture made, a small Discharge of Blood and Ichor followed, the Tumor continued large and scirrhous, with the Appearance of a cancerous Ulcer.

Various internal Medicines, and external Applications were made use of to no Purpose; but the following Method removed this Disorder.

The

The *common Cauſtick*, which is named by ſome *Lapis Septicus*, and by others, *Lapis infernalis*, was applied; after the Separation of the Eſchar, about two Inches in length, the *Lapis infernalis* and *Oleum Vitrioli* were alternately uſed, by rubbing the Part firſt with the *Lapis infernalis*, and, in leſs than a Minute afterwards, with a Piece of Fir-ſtick dipped in the *Oleum Vitrioli*, which inſtantly removed the Pain occaſioned by the *Lapis infernalis*. At each Dreſſing this alternate Application of theſe oppoſite Cauſticks was repeated, till as much was waſted as was then thought convenient; the Moiſture was abſorbed by an armed Probe, and a Digeſtive applied.

By theſe Means the Tumor was gradually waſted every Day, without any *continuing Pain* or *ſucceeding Inflammation*; a ſmall Part was ſuffered to remain adhering to the Teſticle. This was thought more prudent than to run the Hazard of injuring the Teſticle. This Application anſwered lately in another very obſtinate ſcirrhous Tumor in the Coats of the *Teſtes*, and in many Caſes ſeems to be preferable to common Cauſticks; the one correcting by its oppoſite Quality the too active Salts of the other, and by that means inſtantly removing Pain, and by producing a *Sal Tertium*,

um, which has a mild opening Quality, prevents an Inflammation and callous Lips, the common Conſequences of cauſtick Applications.

About three Months afterwards a Tumor appeared in the other Teſticle of this Gentleman, of about the Size of a Walnut, which was removed, by giving him going to Bed at Night 15 Grains of *Pil. ex duobus*, 10 Grains of *Turbith Mineral*, and the ſame Quantity of *Camphire*. It was ſeldom omitted any Night. In the Beginning it vomited him ſome times, and purged four or five Times; but at laſt operated chiefly as an Alterative, and in three Weeks not only carried off this Tumor, but entirely removed the ſmall Swelling that was left on the other Teſticle. This Medicine, which has a rough Appearance, acts as a mild, though a powerful Alterative. The Evacuation which attends it, is generally very gentle. I have often known it ſucceſsful in obſtinate venereal and ſcrophulous Diſorders. Mr. *Moore*, a Surgeon in the Army, to whom I communicated it ſome Years ago, aſſures me it never fails him in obſtinate *Gonorrhœas*, and in many Caſes for which he was formerly obliged to direct a Salivation.

V. *An Eſſay towards aſcertaining the Doſes of vomiting and purging Medicines; by Dr.* CHARLES BALGUY *Phyſician at* Peterborough.

AFter finding out a Diſeaſe, and preſcribing ſuch Medicines as ſhall anſwer the true Indications of Cure; there is nothing in Practice more material, and yet leſs underſtood, than the Art of adjuſting their Doſes ſo nicely to the Caſe in hand, and to the Age, Size and Strength of the Perſon, that he ſhall receive the moſt ſpeedy and certain Relief theſe Medicines are capable of giving, without the Hazard of burthening Nature, and overdoing the Conſtitution. Dr. *Cockburn* attempted this ſometime ſince, in vomiting and purging Medicines; but as he went upon a wrong Principle, he muſt needs be miſtaken in his Conſequences. Perhaps what I'm going to advance may be liable to Objections; I know it is, and I ſhall ſhow that an abſolute Certainty cannot be expected: But yet I think I may venture to ſay, that you go upon ſurer Grounds by following this Method, imperfect as it is, than no Method at all. Firſt then, I ſuppoſe it will be readily grant-

ed me, that part of the Medicine is ſpent on the *primæ viæ*, where it acts as a *Stimulus*; and that the other part is carried into the Blood, and has its Effect there, by thinning and rarifying it: The firſt is plain, from their acrid burning Taſte, and the Bliſters which the moſt powerful will raiſe in the Mouth: The other is certain, from the Pulſe being raiſed after taking them, and from known Experiments upon the Blood: But in what Proportion they exert their different Faculties is the Difficulty; could this be preciſely determined, the Doſes of theſe Medicines might be fixed with the utmoſt Exactneſs and Certainty. All that can be done then is, to aſſign ſuch a Proportion as ſeems moſt agreeable to Experience. Thus we all know, that reſinous Purges exert themſelves chiefly on the firſt Paſſages; whereas the greateſt part of ſuch as are of a more lax Texture is carried into the Blood, and by attenuating it, promotes every other Secretion, as well as that by the Inteſtines. It may ſeem reaſonable therefore to ſuppoſe, that of *Scammony*, *Elaterium*, and the ſtrongeſt reſinous Purges, not more than one fourth gets into the Blood: Of *Jalap*, *Ipecacuana*, *&c.* one third: Of Rhubarb, Senna, Aloes, *&c.* one half: Of *Cremor Tartari*, and the purging Salts two thirds.

This

This being allowed, I proceed in the following Manner: And 1*ſt*, I ſay, If the Medicine acted only on the *primæ viæ*, the Doſe, in Perſons of the ſame Size, would be directly as the Conſtitution; for as the Fibres of the reſt of the Body, ſo are thoſe which compoſe the Stomach and Inteſtines; and the ſtronger they are, ſo much the more able will they be to ſhake off, and diſengage themſelves from the Particles of the Medicine, which are ſuppoſed to prick and irritate them: And therefore ſo much the larger Doſe will be required to have a certain Effect. Where the Conſtitution is the ſame, it is eaſy to ſee that the Doſe will be as the Size; when both differ, then it follows, that the Doſe will be as the Size into the Conſtitution. 2*dly*, Suppoſe the whole Medicine to paſs into the Blood; and the Doſe will be as the Size into the Square of the Conſtitution. This is demonſtrated by Dr. *Cockburn*: And therefore, 3*dly*, You are to doſe ſo much of the Medicine as is ſpent on the Stomach and Inteſtines, directly as the Conſtitution; and ſo much as is carried into the Blood, as the Square of the Conſtitution, and the Sum into the Perſon's Size is the Quantity required. There are ſome Caſes Exceptions to this Rule, which ſhould be conſidered, and provided againſt:

And firſt, in Conſtitutions which abound with Acids in the *primæ viæ*, we find the Force of reſinous Purges ſo weakned, that they ſcarce operate at all. They are alſo leſs active, or a larger Doſe is required, when the Body is full of aqueous Humours; for the ſmall Proportion of Bile in ſuch Conſtitutions not being ſufficient to cauſe a complete Solution of the Reſin in the Water, a conſiderable part paſſes off, without imparting any of its Subſtance: As on the contrary, to Perſons of a dry Habit, and in hot Climates and Seaſons, they often cauſe intolerable Grippings and Hypercatharſes, for want of due Moiſture. But theſe, and others of the like ſort, the Cauſe being known, are eaſily remedied. And though not attending to, or being unacquainted with the State of the Body in theſe particular Caſes, may render this Method leſs uſeful, it is no leſs true on that Account.

VI. *The bad Effects of* Opium *given too ſoon to ſtop the Operation of* Emeticks; *by Mr.* JOHN STEDMAN *Surgeon at* Kinroſs.

NOtwithſtanding all the Caution that can be uſed, *emetick Medicines* will ſometimes do more than is intended they ſhould, either by vomiting more frequently, or by purging. In ſuch Caſes the Patients become alarmed, frighted and impatient; and thoſe who have preſcribed for them, either to humour their Patients, or perhaps too anxious about the Conſequences, have Recourſe immediately to *Opium*, to ſtop any further Effects of the Medicine. I know there is no ſuch powerful and good Medicine as *Opium*, when properly given, to ſtop vomiting or purging: But I cannot forbear to caution young Practiſers, not to be too haſty to give *Opium* in the Caſe mentioned, till the Emetick (and I may ſay the ſame of Purgatives) has wrought itſelf well out of the Body; for I have ſeen ſeveral bad Conſequences from its being uſed too ſoon, of which the following Caſe is a remarkable Example.

A Gentleman, aged forty nine, being

troubled with a Cough, was prescribed 5 Grains of *Emetick Tartar* by his Physician: The Patient obliged his Apothecary to give him 6; which after vomiting him six or seven Times, began to purge him with Gripes. The Gentleman turned impatient; and, without Advice, took 20 Gutts of *Laudanum* in a Glass of White Wine; *Opium* having been a familiar Medicine for some Time, to remove a Watchfulness he was subject to. In half an Hour after taking the *Laudanum* he was free of the Gripes and purging; but in half an Hour more became short-breathed, with Sweating about the Heart; then I was first sent for in a Hurry, but before any thing could be got done for his Relief, he died.

VII. Pulvis Stypticus *recommended particularly in uterine Hæmorrhagies; by Dr.* ALEXANDER THOMSON *Physician at* Montrose.

SCribonius *Largus*, the *Roman* Empyrick, made Use of simple *Alum* in the Evacuations of the Sex exceding their due Bounds; and I have been told by Ladies, that it has very good Effects.

Hel-

Helvetius improved on this, by adding *Sanguis Draconis*, whether as a *Larva*, to make it his own; or to prevent the Uneaſineſs of the Stomach, which he might ſuſpect the *Alum* might give, I can't determine: But Dr. *Pitcairn*, whoſe Memory muſt continue as long as Phyſick is known, was the firſt who introduced the Uſe of it into this Country; at leaſt, it was he who firſt deſired me to make Experience of it in a Caſe which had reſiſted a great many other Medicines. Its Reputation kept up many Years, under the Name of *Pulvis Helvetii*, as an Aſtringent, eſpecially in uterine Hæmorrhagies; and I ſee it inſerted in the *Pharmacopœia* of your College of Phyſicians, by the Name of *Pulvis Stypticus*; though in ſome different Proportion, and different Manner of preparing, from what I have commonly uſed. The Diſpenſary Powder being prepared of a double Quantity of *Alum* to one of the *Gum*, and made into a Powder, without being put near to the Fire; whereas what I have uſed was equal Parts of both, the *Alum* being firſt melted in a Crucible, and the Powder of the *Sanguis Draconis* added to it, and then powdered together in a Mortar; poſſibly the Difference of their Effects may notwithſtanding be very little.

The Uſe of both I think is now much laid aſide, which I cannot but regrete; ſince I never found any Medicine (and I have tried ſeveral) ſo much to be depended on in all the *uterine Hæmorrhagies*; whether to correct the too frequent Return of the *Menſes*, or their too great Abundance; to ſtop the *Flooding* which Women with Child are ſo ſubject to, or to moderate the Flow of too plentiful *Lochia*. I have tried it in ſo many Caſes with Succeſs, that it would be altogether tedious to give you their Hiſtories.

The Quantity I give of the *Pulv. Helvetii* is more or leſs according to the Exigencies of the Patient: In violent Bloodings I give half a *Drachm* every half Hour, and ſeldom or never miſs to ſtop it before three *Drachms* or half an Ounce is taken.

The Succeſs of this Medicine in theſe bloody Evacuations has encouraged me to preſcribe it alſo in the *Fluor albus*, that obſtinate pernicious Diſeaſe of the Sex, in which I have been ſurpriſed at its good Effects.

VIII. *Vio-*

VIII. *Violent Effects of a* Mercurial Suffumigation; *by Mr.* JAMES HILL *Surgeon in* Dumfries.

A Tall gigantick Woman, ſixty three Years of Age, complained to me of a Hoarſeneſs and ſore Throat, which ſhe had laboured under ſome Months, owing, as ſhe ſaid, to a Cold; but having obſerved ſome ſcabby Cruſts on her Arms and Forehead, I ſuſpected her Diſeaſe to be venereal; and at laſt was informed it was a *Lues* of four Years ſtanding. Her other Symptoms were a weak low Pulſe intermitting every third or fourth Stroke; which ſhe was ſenſible of, by a painful fluttering at her Heart, as ſhe called it. She had ſo many Excreſcences of every Sort about the *Pudenda*, ſhe could neither ſit nor walk without Pain. The *Cephalalgia* and other nocturnal Pains were ſo violent, that frequently ſhe ſlept none all Night. By the long Continuance of her Diſeaſe, and the Bloodings and rough Medicines ſhe had undergone, ſhe was reduced almoſt to a Skeleton.

Her Caſe appeared deſperate; but the Woman beg'd ſo movingly for Relief, and

Dr.

Dr. *Turner* recommends his Method of *Cinnabarin Fumigations* in the very worſt Circumſtances ſo much, that I reſolved to make Trial of their Effects.

On *Monday* 1ſt *April* 1734, at Nine a-clock of the Forenoon, I burnt half a Drachm of *factitious Cinnabar* under her Noſe and Mouth; which ſhe bore very well, ſucking in the Fumes greedily, with little Cough. I left her wrapped up ſweating and ſpitting. At Twelve ſhe had ſpit half a Pound, was coughing a little, and the Room ſmelled pretty ſtrong of a riſing Salivation. Her Pulſe was quicker and fuller, but very irregular and intermitting. She would not acknowledge herſelf to be ſick, but ſaid her Throat was eaſier. I ordered her to keep warm. At Three after Noon the Room ſmelled as ſtrong as any I ever felt, when the Patient was ſpitting three or four Pounds a-day. She had had three Stools, was very ſick, and complained of exceſſive Gripes. Her Pulſe was quick, low, quivering and intermitting. I gave her 10 Drops of *Laudanum* in a Glaſs of a Cordial aſtringent Julep, put her into Bed with her Clothes on, and wrapped her up for ſweating. At Nine in the Evening ſhe was in a very profuſe Sweat; her Pulſe going at a high Career, full, ſtrong, and intermitting only one Stroke

Stroke of twenty one or twenty two. She told me ſhe was altogether free of Sickneſs, without any fluttering at her Heart. I left other 10 *Gutts* of *Laudanum* in a *Hauſtus*, to be given if the Gripes ſhould return; which they did after Midnight, ſhe having then expoſed herſelf to Cold, by undreſſing to go naked to Bed. She had three Stools before the *Laudanum* had Effect, but grew eaſy again as ſoon as the Sweating returned.

In this Condition ſhe continued all *Tueſday*, the Gripes, Sickneſs and intermitting Pulſe returning every ten or twelve Hours, and the profuſe Sweat ſucceding after taking the Opiat Draught.

On *Wedneſday* Morning the Opiat was omitted, and ſhe had twenty Stools with the Sickneſs, Gripes and Intermiſſion of the Pulſe, by which ſhe was much weakned. I again ordered the Opiat in a Glaſs of warm Claret, in the Afternoon; which brought back the Sweat, and removed the other Symptoms; and I gave her ſome *Ung. Citrinum* to anoint the Sores with.

She paſſed *Thurſday* the ſame way as *Tueſday*, the fetid ſalivating Smell ſtill continuing.

Friday Morning, at ſeven a-clock, ſhe took a purging Potion, which did not operate at Nine, ſhe lying and ſweating. At Eleven

Eleven I ſent a *Stimulus*, to be taken if her Potion had then no Effect; ſhe concealed her having had three Stools, and ſwallowed the *Stimulus*: By which ſhe was purged ſo ſeverely, that at Six in the Evening ſhe ſeem'd almoſt like one about to expire, but was ſoon relieved by her ordinary Anodyne, and lay perfectly eaſy all Night in a Sweat. By this Time her Throat was almoſt quite well, and all her other Sores were entirely healed.

Saturday Morning ſhe had the Gripes, Sickneſs, and irregular Pulſe; notwithſtanding this ſhe walked that Day ſix or ſeven Miles, and rode one or two home, in wet cold Weather.

On *Wedneſday* I was told ſhe was no worſe, the Purging ſtill continuing till the middle of *May*. Her Throat appearing a little tender, I gave her a Solution of *Calomel* in *Aq. Roſar.* to gargle with, deſiring her to ſwallow none of it. This however purged her a little. Afterwards ſhe took Dr. *Plummer*'s Pills, with the *Sulphur aurat. Antim.* and *Calomel*, and drank the Decoction of the Woods. With theſe ſhe ſweated plentifully in the warm Weather, but became free of all her former Complaints, riding about to Markets. When the cold Seaſon came on, the Purging ſucceded

ceded the Sweating now and then, till it went quite off in *February* 1735, when her Legs began to ſwell; of which ſhe was relieved by two Doſes of Purgatives. But the Swellings returning again, and ſhe being neglected, they increaſed; ſhe waſted, and at laſt died toward the End of *April*.

IX. *The Effects of a very ſmall Quantity of* Arſenick; *by Dr.* Alexander Thomson *Phyſician at* Montroſe.

A Lady finding ſome *Arſenick*, which ſhe knew not, among other Things, for the Uſe of the Family, put a little of it into her Mouth, as People ordinarily do when they would diſcover Things by their Taſte. Soon after, ſhe came to know what it was; but being, as ſhe thought, certain that ſhe had ſwallowed none of it, would uſe no Precaution, and felt no Change on herſelf for twelve Hours. Then ſhe became ſuddenly *vertiginous*; and being carried to Bed, her Body was all over convulſed, ſo as by her Motions the Bed and Chamber were ſhaken. I ſaw her four Hours after this Attack in this Condition; it was too late to give her a Vomit, neither did

did ſhe complain of any Diſorder in her Stomach or other Bowels. I gave her a much *Ol. Amygd. d.* as ſhe could bear, and ordered an Injection of *Ol. Olivarum*; whereby hard *Fæces* of the Shape and Figure off Sheeps Dung, and as deep-green a Colour as Cappers, were brought away. I repeated the Injections, till the Clyſter came away as it was injected, without any of theſe *Fæces*.

The Convulſions and Frights in her Sleep, procured by *liquid. Laudanum* given in Emulſions, ſtill continued; and ſhe awaked often with ſuch Startings, that had not one in the Bed held her firmly, ſhe would have been thrown out of it. In this Condition ſhe remained a whole Day and Night.

The Day following, her Body, but eſpecially her Head, Face and Neck, were all covered over with red Spots like *Meaſles*, with exceſſive Glowings and the *Aurium Tinnitus*. Her other Symptoms however began to abate.

To advance the Eruption, and thereby to carry off the internal Diſeaſe, I gave *diaſcordium* and *volatile* Medicines, whereby ſhe recovered of all the Symptoms from the Poiſon in five or ſix Days, but remained deprived of a fine Conſtitution ſeveral Years after.

X. *Hi-*

X. *Hiſtories of* Gangrenes *cured by the* Peruvian Bark; *by* ſeveral Hands.

'TIll the good Effects of Medicines are aſcertained by a ſufficient Number of well-vouched Hiſtories, Phyſicians and Surgeons muſt be cautious in giving, far more in depending on ſuch as are recommended only by Report, or People whom they have no Reaſon to confide in: We believe therefore it may be of Uſe to the Publick to collect here the Hiſtories of the Service of the *Peruvian Bark* in *Gangrenes* from different Cauſes, which we have been favoured with from our Correſpondents. We have taken the Liberty to abridge them, without, we hope, ſuppreſſing any thing that is material.

Firſt Caſe, communicated to us by Mr. *John Paiſly* Surgeon in *Glaſgow*, was a Diary kept by Mr. *John Hamilton* Student in Phyſick and Surgery, of his Father's Diſeaſe, reviſed and approved by the ordinary Phyſician, Dr. *George Thomſon* Phyſician in *Glaſgow*.

Archibald Hamilton of *Weſtburn* Eſq; aged ſeventy ſix, who had enjoyed uncommon

mon good Health all his Life, having been ſcarce ever ſick or out of Order, 'till he was ſeized with an *Hemiplegia* two or three Years ago, of which he recovered ſo well, by the Aſſiſtance of Dr. *Thomſon*, that he walked abroad with the Help of a Staff. 10th *April* 1735, complained of a Pain in the Toe next to the little one of the right Foot; but neglected it two or three Days, till the Pain increaſing, with an ouzing of Ichor from a ſmall black Spot; and his Ancle ſwelling, ſome Tincture of *Myrrh* and *Aloes* was applied to it.

On the 14th, the Swelling had gone a good Way up his Leg and the Spot was very black and dry. Antiſeptick Fomentations and the Tincture were uſed. Notwithſtanding which, and a Mixture of *Succus Cicutæ* and *Sp. Sal. Ammon.* with the Tincture, all the Symptoms increaſed next Day. The Doctor preſcribed a Draught of the *Decoct. amar.* in which half a Drachm of the *Cortex Peruvianus* was boiled, to be taken every Morning.

The Day following, *viz.* 17th, the Bone of the Toe appeared bare, the Fleſh round it mortified, and black Spots were ſeen upon the Ancle and Calf of the Leg.

18th, The Toe was cut off at the ſecond Joint; Digeſtive was applied, and the Leg

was

was embrocated with *Sp. Anthos*, *Sal Ammoniac*, and *Camphor*. All the Medicines being continued, there was no great Change for three Days.

On the 21st, the black Spots looked paler, but the Toes were all livid.

22d, His Pulse intermitted, and he was very uneasy.

23d, The Toes very black.

24th, The Sore very fetid. The black Spots in the Leg began to disappear.

25th, The Spots of a pale red Colour. A great Pain in the Sole.

No great Change on the 26th and 27th.

28th, The little Toe was cut off. Appearance of Suppuration, with violent Pain in the Sole of the Foot.

29th, The Patient slept none, was very feverish, and raved, with wild Looks. An emollient Pultice applied to the Sole.

30th, Still raved. The Swelling of the Leg almost entirely gone. No Spots on it.

1st *May*, Bloody sanious Matter let out by an Incision in the Sole, where the Tendons were bared, and very tender.

2d and 3d, As formerly.

4th, The two remaining lesser Toes having mortified, were also taken off. The great Toe a little livid.

5th, The upper Part and Sole of his Foot

ill-coloured. His Appetite now for the first Time failed him.

6th and 7th, Little Change.

8th, Fifteen Grains more *Cortex* added to each Draught.

9th, The Swelling in the Leg much diminished.

10th, The Ulcers in the Foot larger.

11th, As on the 10th.

12th, Towards Night he had frequent Faintings, an intermitting Pulse, great Oppression and Sickness with Strugglings. Took *Sp. Lavend. compt.* and *Salin. aromat.*

13th, Much relieved, but still confused with wild Looks.

14th, He was calm and chearful, with a regular Pulse.

15th, The Swelling of the Leg being now gone, the spirituous Embrocation was laid aside.

16th, The Ulcer was cleaner. Half a Drachm more *Bark* was added to each Draught.

From this to the 26th of *June*, his Cure seem'd to go on successfully, with his Dressings and Decoction.

26th *June*, The Foot began to swell with great Pain.

27th, The Swelling increased up the Leg;

and

and the great Toe, which had been hitherto of a blueiſh Colour, became nearer to a black Colour. The Decoction was continued, and the ſpirituous Embrocation was again uſed.

The Swelling, with black Spots about the Ancle, increaſed up to his Knee before the 7th of *July*, when the Ulcer in his Foot was black. Inſtead of the *Decoct. amar.* he was now ordered to take half a Drachm of the *Bark* in ſubſtance, Morning and Evening.

8th *July*, Black Spots appeared above as well as below the Knee, one of them was two Inches in Diameter.

9th, The Swelling of his Foot leſs.

10th His right Teſticle alſo ſwelled.

Little Change till the 15th, only the ſwelling of the Teſticle abated.

15th, He would ſit up. The Leg ſwelled greatly.

16th, Many ſmall, livid, or pale red Spots above the Knee.

Till the 20th the Appearances all better; the Swelling diminiſhing; the Spots going off; the Ulcer digeſting.

20th, He had got little Sleep, had great Pain; his Pulſe was oppreſſed, and he very faintiſh: he took ſome cordial Drops, without any Relief. The Doſe of his *Bark* was

increaſed to two *Scruples*, Morning and Evening.

Next Day the Leg looked worſe, but much better the two following Days.

24th, In the Night before, he had a great Sweat in the Thigh and Leg, and the Swelling was fallen two Inches.

The Cure went well on with the *Cortex*, without any new Symptom, till *Auguſt* 10th, when a ſmall Tumor was obſerved near the Heel; the Matter from which diſcharging at the Ulcer in the Sole of the Foot; it was afterwards cured by Compreſſion. The ſwelling of the Leg appearing now to be only oedematous, was bandaged up to the Knee.

In the Beginning of *October*, when the Sores ſeem'd to be near cured, he omitted the *Bark*; but a Bliſter as big as a Hen's Egg, riſing on the great Toe of the left Foot; and, two Days after, ſuch another appearing on the great Toe of the right Foot, he returned again to the Uſe of the *Bark*: The Skin, which they covered, is freſh and clean. The other Ulcers are now near healed; and we reſolve to continue the *Bark* ſome time after the Cure, to prevent more Returns.

It is to be remarked, that during all the Time of the Cure, except when the Patient was

was ſick and oppreſſed, he would not be confined to any *Regimen* in Diet, but indulged himſelf even in a plentiful Uſe of Salt Meats and ſtrong Malt Liquors.

Obſ. II. Mr. *William Wood* Surgeon in *Edinburgh* informs us, that a young Woman, who was brought very low both in Fleſh and Strength, by what was judged an *Atrophia*, from Obſtructions in the Meſentery, had her Feet greatly ſwelled in the oedematous way, as all the depending Parts of her Body, even in a lying Poſture, alſo were; which ſhewed the *vis vitæ* to be very weak, and the ſmall Remains of her Blood to be in a very watery State. The Skin on the ſuperior Part of the right Foot having become black, with all the other Symptoms of Mortification; Dr. *Francis Pringle*, who had attended her in her former Diſeaſe, and Mr. *Monro* who was called upon this gangrenous Appearance, agreed with Mr. *Wood* in Opinion, that the mortified Foot ſhould be well fomented with an antiſeptick Decoction, that all the Gangrene ſhould be ſcarified, and *Baſilicon* with *Oil of Turpentine* applied in the Inciſions, and a Cataplaſm of *Theriac* put over all; and that ſhe ſhould immediately begin to take a *Scruple* of the Powder of the *Peruvian*

ruvian Bark four times a-day. Three Days after, the mortified Parts began to ſeparate from the Sound. In two Days more, ſhe neglected her Doſes of the *Bark*; very ſoon after which, there was no more Appearance of any further Separation; and upon taking her Medicine, the Separation went on as formerly. Her former Diſeaſe killed her in few Weeks, without any further Progreſs, or new Attack of the Gangrene.

Obſ. III. Dr. *Thomas Simſon*, Profeſſor of Medicine in the Univerſity of St. *Andrew's*, ſent us the following Obſervation.

John Daw, about fifty Years of Age, Servant to a Miller here, after being employed all Day in ſupplying Corn to the Mill in a Sieve, felt an Uneaſineſs near the Inſertion of the Tendon of the *Flexor* of the laſt Joint of the Fore-finger, where the Edge of the Sieve, in which he had carried the Grain, reſted. The Joint being alſo a little ſwelled, he was adviſed by his Neighbours to apply ſome *White Lilly* Root to make it ſuppurate. After applying this eight Days, meeting me in the Street, he ſhewed me his Hand; the whole Finger and Part of the *Metacarp* were now ſwelled, and there was a ſmall Opening at the ſecond and third Joints of the Finger, out of which a

ſerous

ſerous dark-coloured Matter iſſued. I deſired him to apply a warm Pultice of boiled Oatmeal, to let Blood, to take a *Mercurial Bolus* at Night; and ſome *Jallap*, for a Purgative, next Day.

Three Days after, the 20th *March* 1736, I was ſent for to viſit him. Ever ſince the Purgative, which had operated mildly, he had been feveriſh, and his Hand was much worſe; the two Under-joints of the Finger being quite mortified, there was a large gangrenous Bliſter both on the back and fore-part of the *Metacarp* next to that Finger. A very conſiderable florid *eryſipelous* Swelling, which pitted, when preſſed, extended itſelf as far up as his Elbow; and there was a Tenſion and Fulneſs on his Arm and in the Arm-pit. I ordered the gangren'd Parts to be fomented with Spirit of Turpentine, and gave him half a Drachm of the *Pulv. Cortic. Peruv.* every fourth Hour.

Next Morning the Inflammation had made no further Progreſs, and in the Evening the Swelling and florid red Colour extended no higher than his Wriſt; and even below that the Appearances were better, the Parts being more ſenſible, and the Suppuration beginning round the middle Joint of the Fore-finger. I continued his Medicine, and on the 24th there was a compleat

Separation of the mortified Parts, the bliſtered Skin caſt off, and there was an Ulcer penetrating from one Side to the other of the Articulation of the firſt Bone of the Fore-finger with the *Metacarpal*, from which a Liquor in Colour like to the Decoction of the Bark was evacuated.

The two mortified Joints were cut off; I continued the Uſe of the Bark eight Days longer, but diminiſhed the Number of Doſes. The Stump was gradually covered with Fleſh; and after a Tendon was caſt out of the Ulcer in the *Metacarp*, all the Sore ſpeedily cicatrized.

Obſ. IV. Dr. *Simſon* has alſo favoured us with another Example of the good Effects of the Bark, in a Caſe which he cannot determine to have been a Gangrene, becauſe he did not ſee the Patient.

Mr. *Morton* an Apothecary in *Coventry* wrote to him, that he, Mr. *Morton*, had laboured more than a Year under a ſore Throat, occaſioned by a Spot at the Root of his Tongue no bigger than a Sixpence; which had been judged unanimouſly to be cancrous, and for which he had undergone a Variety of Cures, preſcribed by the beſt Phyſicians. His Deſcription made Dr. *Simſon* ſuſpect it rather of the Nature of a Gangrene;

grene; and as he had had Experience that the Bark would do no Harm in Cancers, he deſired him to try that Medicine. After taking it ſome Time, Mr. *Morton* writes the Doctor, That, ſince uſing it, he had ſpit up a great deal of dead Filth from the Sore which was filled up, though ſtill it was painful and hard about the Edges.

Obſ. V. Mr. *Gibſon*, Town's Profeſſor of Midwifery and Surgeon of *Edinburgh*, favoured us with a remarkable Inſtance of the good Effects of the *Cortex* in *Gangrenes*.

Mr. *Alexander Bayne* Merchant in *White-horſe Yard* near *Drury-Lane*, *London*, aged forty, of a groſs ſcorbutick Habit, in mounting a vicious Horſe on the 4th of *June* 1735, was thrown on the Pin of a Cart; by which a large penetrating Wound was made in the under Part of the *umbilic* Region, and ſomewhat towards the right Side, through which the *Omentum* did fall down four or five Inches, with its lower Edge lacerated. There was alſo a ſimple Fracture of the *Fibula* of his left Leg.

I attended him with two other Surgeons, and finding the Colour of the *Omentum* changed, by being expoſed ſome time to the Air, I extracted a little more of it ſoftly

ly, and made the uſual Ligature upon the ſound Part, and then cut it off to within half an Inch of the Tying, allowing afterwards the Extremities of the Ligature to hang out of the Wound, 'till it ſhould fall off by the Suppuration. I thought the *Omentum* drawn together with the Ligature would favour the Diſcharge of Blood or Matter, as well as the Tents which Authors enjoin in ſuch Caſes, without the Pain or Inflammation which theſe cauſe. The external Wound was dreſſed with Pledgits dipt in a warm Digeſtive, and ſupported with Compreſſes and Bandage, ſo tight as to prevent the *Prolapſus* of any of the other *Viſcera*. The Fracture of the *Fibula* was eaſily reduced, and dreſſed in the ordinary Way. He was plentifully blooded, and an emollient Clyſter was injected.

Dr. *John Jamieſon* was called to our Aſſiſtance, and attended him afterwards all the Time of the Cure.

The two following Days no extraordinary Symptom appearing, he was dreſſed as formerly.

On the 7th of *June* the Digeſtion was begun.

On the 8th there was a reaſonable Diſcharge of laudable well digeſted *Pus*.

But

But on the 9th in the Morning we were informed he had had a reſtleſs Night, having drank much, yet making no particular Complaint; Though his Tongue was white, it was not parched, nor had he any conſiderable Heat or Degree of Fever on him now, or ever after. The Dreſſings, when taken away, were dry, and ſome more than two Inches round the Wound the Parts were livid and inſenſible. The Teguments were immediately ſcarified, and ſtup'd with a proper heating Fomentation. Pledgits dip'd in warm Oil of Turpentine were applied to the Scarifications, and a Pultice of *Theriac*, moiſtned with Spirit of Wine, was laid over all, and half a Drachm of the *Pulvis Cortic. Peruvian.* was ordered to be given every fourth Hour, drinking a ſmall Glaſs of old ſtrong Claret after it.

In the Evening, the Mortification had made no further Progreſs, and we obſerved a kind of Dew on the Dreſſings, which were renewed as before; and the *Cortex* was regularly given through the Night, which he paſſed with more Eaſe than he had done the preceding one.

Next Day there was a plentiful Diſcharge from the Wound of excellent Matter, and an *Ichor* from the Scarifications.

The

The *Bark* was continued till the 14th, when not only the Diſcharge at the Wound continued good, but the Inciſions yielded laudable *Pus*; and all our Fears were over.

On the 15th, the Fracture was dreſſed, and appeared in a good Way.

On the 16th he complained of a Senſe of Cold in the Foot of the fractur'd Leg; which alarming us, we undid the Dreſſings, and found the Skin livid and cold as Ice, with gangrenous *Veſiculæ* here and there, which immediately were cut, and ſtupped with a warm ſtimulating *Fotus*. The Wound in the Belly, which was dreſſed at the ſame Time, diſcharged only a ſmall Quantity of a fetid bloody *Ichor*, the Colour of the Skin round it being much paler than uſual; wherefore we, without Delay, had again Recourſe to the Bark, which anſwered our Expectation ſo well, that at next Dreſſing we had well concocted Matter from the Wound, and the Foot had recovered its natural Heat and Colour next Morning. We determined therefore to continue the Uſe of this excellent and neceſſary Medicine for a conſiderable Time: And indeed we had Occaſion oftner than once to obſerve how much we ſtood indebted to it in this Cure; for if at any Time of the firſt three Weeks, the Diſtance of Time between

tween taking each Doſe exceded eight Hours, we were ſure to find the Matter in leſs Quantity, and of a much worſe Quality.

Our Patient was cured in five Weeks, and was deſired to wear a poſting Belt, with proper Compreſſes upon the Place where the Wound had been for ſome Time, till the Cicatrix was ſufficiently hardned, that upon any violent Motion a *Hernia* might be prevented.

Obſ. VI. Mr. *James Calder* junior, Surgeon in *Glaſgow*, writes us, That a Boy of twelve Years of Age, of a good Conſtitution, having, by jumping, violently ſtrained the Articulation of the Foot, it ſwelled conſiderably; and a Prentice having applied a tight Bandage to it, before next Night, when Mr. *Calder* firſt ſaw it, the Inflammation was greatly increaſed, and black Spots appeared upon the Surface of the Skin. The Boy's Pulſe was high and quick. He was blooded, and had Clyſters given him; the Part was well fomented, Pultices and ſpirituous Medicines were applied, and it was at laſt ſcarified. After a Variety of the common Medicines had been uſed eight Days to no Purpoſe, the gangrenous Spots ſpreading and turning deeper,

Mr.

Mr. *Calder* gave his Patient a Scruple of the *Pulv. Cortic. Peruvian.* four times a-day; and in six Days after his first beginning to take this Medicine, the putrid Parts separated and cast off, and the Cure went on afterwards as that of a common mild Ulcer uses to do.

Obs. VII. Mr. *Monro* Professor of Anatomy informs us, from the Records of the *Infirmary* here, That, on the 13th Day of *March* 1735, *Robert Biggins*, a middle aged labouring Man was received as a Patient there. By a Fall he had broke both the Bones of the Leg, three Inches above the Articulation of the Foot. There was a large Wound on the anterior Part of the Fracture, and a violent Inflammation and Tension on the whole Leg, with a Mortification begun near the Wound. In which Situation it would not allow of the Extension necessary for a Reduction.

For the first four Days he was treated in the common Method for Gangrenes, by fomenting the whole Member, Scarifications and warm spirituous Applications to the gangren'd Parts; and emollient Pultices over all, with Bleeding and low Diet. The Tension yielded a little to these, but the Gangrene advanced.

On the 17th he was ordered to take thrice a-day the Bulk of a Nutmeg of an Electuary, compoſed of the Powder of *Cortex Peruvianus* and *Syrup. Cariophyl.* and to continue the former Applications.

18th, There was a remarkable Change for the better; but on the 19th the Fomentation being neglected, the Pain became more violent, and the Appearances worſe.

The *Bark* and Fomentation being again uſed, the Appearances were all good; and the bad Symptoms decreaſing daily, the Fracture was reduced on the 24th, and the Cure went afterwards on in the common way.

Obſ. VIII. Mr. *John Douglas* Surgeon in *Edinburgh* informs us, That——*Porteous*, a labouring Man at *Lintoun*, about twenty Years of Age, having fractured his Arm by a Fall from a Cart, had it bandaged up by ſome of his Neighbours, without reducing the Fracture. Thirteen Days after, Mr. *Douglas*'s Advice was firſt asked, when a large Swelling and conſiderable Mortification were brought on the Part; his Pulſe being felt at the Wriſt of that Arm in a natural State, and there being little Tumor in the Hand, he adviſed the gangren'd Part to be ſcarified, and to give the Patient half a

Drachm

Drachm of the Powder of the *Bark* every three or four Hours. Ten Days after, when he was again called to him, the ſwelling of the Arm was fallen, and a great Share of the ſphacelated Parts were ſeparated; he then attempted the Reduction of the Bone, which he could not accompliſh 'till he ſawed off a little of the lower Piece of the fractur'd Bone, when he obſerved all the Parts which the Bones hid before were mortified, except the Artery and a ſmall Share of the Teguments on the back Part of the Arm: He therefore performed the Amputation cloſe by the Head of the *Os Humeri*, beyond which the Mortification extended a conſiderable way; ſo that he had great Difficulty in ſtitching the Artery, the corrupted Fleſh always yielding as he paſſed his Needle. He was obliged to apply Bandages, and therefore could not ſcarify, nor uſe the common Medicines in ſuch Caſes, but was obliged to truſt entirely to the *Bark*, which he ordered to be given as formerly. In few Days a good Suppuration came on, and the Patient cured eaſily, and is now in good Health.

We have heard of ſeveral *more* Caſes of *Gangrenes*, both from internal and external Cauſes, where the Bark was given, eve-

ry

ry one of which was successful; but we think these, with the Histories published in *Art.* V. and VI. of our *Third Volume*, are sufficient to convince the most incredulous how valuable a Discovery has been made by Mr. *Rushworth*, who was the first who employed the *Peruvian Bark* in *Gangrenes*. See *p.* 383 of *Vol.* II.

XI. *The Description and Uses of the* Intestinum Duodenum; *by* Alex^r. Monro *Professor of Anatomy in the University of* Edinburgh, *and* F. R. S.

ANatomists having generally copied *Vesalius*'s (*a*) Description and Picture of the *Intestinum Duodenum*, which appeared to me very faulty, I caused Mr. *Cooper* to draw that Intestine in its natural Situation several Years ago: Since that Time I have read two Authors, *Santorini* (*b*) and *Winslow* (*c*), who have described this Gut more accurately than *Vesalius*; but neither of them having given any Figure of the Parts, and my Description dif-

(*a*) De corp. hum. fabric. lib. 5. cap. 4.
(*b*) Observ. Anat. cap. 9. § 7.
(*c*) Exposition Anat. traité du bas ventre, § 105, &c.

fering conſiderably from theirs, as will appear upon comparing them; I reſolved to ſend you this Paper, that the exact Situation of this Inteſtine might be more generally known, by which many Phænomena in the animal Oeconomy and Diſeaſes may be underſtood and explained.

From the *Pylorus*, which is raiſed upwards and backwards from the Stomach, the *Duodenum* deſcends obliquely to the right Side, with the anterior *Lamella* of the *Omentum* fixed to its inferior Part; and the *little Omentum*, proceeding from the oppoſite Part, to connect it to the Liver. After this, the *Duodenum* is involved for about an Inch and a half, in a Doubling of the *Omentum*, and then enters into the Duplicature of the *Meſocolon*, where it can't be ſeen without diſſecting away that fatty Membrane. It deſcends in this cellular Sheath, till it is almoſt contiguous to the great *Sac* of the *Colon*, which properly is the human *Cæcum*. In this Deſcent the Colon lies before it; the bilary Duct, hepatic Artery and Nerve, *vena portarum*, and emulgent Veſſels are behind it: The Liver, Gall-bladder and right Kidney are on its right Side, and the *Pancreas* is on the left. This Gut makes ſeveral Turns in this Progreſs; for it is raiſed into a Convexity forwards, where it paſſes before:

fore the Veſſels of the Liver. Immediately after, it bends backwards and to the right Side, till it approaches the right Kidney, and then turns forward, and a little to the left in its Courſe towards the great *Sac* of the *Colon*. The *Duodenum* then makes a conſiderable Curve to the left Side, where it is involved in a cellular Subſtance, which may be looked on as the common Root of the *Meſentery* and *Meſocolon*, through the Membrane of which it may be ſeen commonly, even in very fat Bodies, without any Diſſection. In the concave left Side of this Curve, the thick Extremity of the *larger Pancreas* and the *little Pancreas* are lodged; the ſuperior meſenteric Artery and Vein coming through the Notch between the *larger* and *leſſer Pancreas* hang looſe before the Gut here; and the *Ductus communis Cholidochus*, after paſſing behind the Gut a little higher, unites commonly with the pancreatic Duct, very little above the loweſt Part of the Curve, and after paſſing obliquely through the Coats of the Gut, the two Ducts open by one common Orifice in the poſterior Part of the *Duodenum*. After the Curve juſt now deſcribed, the *Duodenum* is involved in the Root of the *Meſentery*, and mounts obliquely within it towards the

left Side, with the *Vena Cava* behind it; and after a Course of about four Inches there, rises forwards, to acquire a proper *Mesentery*, or to commence *Jejunum*, the Membranes of the Root of the *Mesentery* seeming to make a Ring at which the Gut comes out, though they are really continued on the Intestine, and form its external membranous Coat.

That the *Duodenum* may be all exposed to View, without changing its natural Situation in a Body lying supine, it is necessary to cut through the *great Arch* of the *Colon* below the Bottom of the Stomach, and after turning the cut Extremity of the left Side over on the left short Ribs, to take hold of the other Extremity of the *Colon*; and having separated it with a Pair of Scissars from the Stomach and Liver, taking away with it as much of the *Omentum* and *Mesocolon* as obstruct the View of the *Duodenum* and *Pancreas*, to lay it likewise on the right Loin. When the *Colon* is removed, observe where the Roots of the *Mesentery* and *Mesocolon* cover the *Duodenum* so much as to prevent your seeing its Course; at such Places cut these Membranes with a very sharp Scalpel, directing the Incisions according to the Length of the Gut, and then cautiously separate the Membranes

to

to each Side, till all the Inteſtine is in View. Laſtly, draw the ſmall Guts gently down, raiſe the Liver, and ſuſpend the *Fundus* of the Stomach as much as is neceſſary to allow a full View of the whole Courſe of the *Duodenum*.

Thoſe who have ever diſſected the human Body muſt be ſenſible how difficult it is to lay the *Duodenum* of an Adult all in View, without diſturbing its Situation, and the Task of keeping all the Parts in the ſame fit Poſture till a Painter delineates them, is ſtill much greater: Therefore, though the preceding Deſcription is taken from the adult Body, I choſed to lay the Body of a *Fœtus*, which I had preſerved ſeveral Years in acidulated Spirit of Wine, before Mr. *Cooper*, to draw the Picture from, and afterwards I compared this Picture with ſeveral adult Bodies, to make ſure of there being no eſſential Difference.

In *Tab.* I. *Fig.* 1. are repreſented;

A A The *Liver*, larger proportionally than in the Adult, and raiſed ſo that its concave Side is in View.

B The *umbilical Vein* entring the Liver.

This Vein is commonly deſcribed and painted as paſſing to the *Vena Portarum*, without ſending off any Branches; But in

all the human Fœtuses, or young Children which I have dissected, after their Vessels were injected, I always saw the umbilical Vein giving off Vessels to the Liver, in its Passage through it towards the *Vena Portarum*.

C The *Gall-bladder* full of Bile, of a more pyriform Shape than it is for ordinary in an adult.

D The *Stomach* distended with Air.

E The Remains of the *Omentum*.

FF The Extremities of the divided *Arch* of the *Colon* laid to each Side.

G The *Pylorus* where the *Duodenum* begins, and the *little Omentum* connects it to the Liver. From this to H it is covered by the *Omentum*. Between H and I this Gut is lodged in the cellular Substance of the *Mesocolon*, thence to K it is covered by the common Root of the *Mesocolon* and *Mesentery*. It runs involved in the *Mesentery* to L, where there is an Appearance of a Ring; but instead of being turned down afterwards, as here represented, because of the Guts being drawn so much down to have a full View of the *Duodenum*, this Gut makes the Curvature delineated in *Fig.* 2.

M The *large Pancreas* with its Duct, which is more hid by the Stomach in an Adult.
N The *little Pancreas* with its Duct.
O The Meſeraic Artery and Vein cut as they paſs in the Niche between the *larger* and *leſſer Pancreas*.
P The *Ductus communis Cholidochus* appearing on the left Side of the Gut, where it is about to join the *Pancreatic*.
Q The right Kidney.
R The ſmall Guts.

From the Deſcription of the *Duodenum* it muſt appear, 1. That ſince it is involved in the cellular fatty Subſtance of the *Omentum*, *Meſocolon* and *Meſentery*, without having the firm external Membrane braced upon it as the other Guts have; it muſt therefore more eaſily yield to any diſtending Force: And having the whole Subſtances thrown into the Stomach with the Bile and pancreatic Juice poured into it, it muſt receive more than any other Inteſtine; and then whatever enters it, muſt go out with ſome Difficulty, becauſe its Extremity next to the Jejunum, is fix'd in a Courſe almoſt perpendicular upwards. So that upon the whole, it is no Wonder that this Inteſtine is frequently found of ſo much larger

Diameter than the other Guts, as to be called *Ventriculus Succenturiatus* by ſeveral Authors.

2. The aſcending Courſe of the Extremity of this Gut, and the Influx of the Bile and pancreatic Liquor into the moſt depending Part of it, where the Food muſt make the longeſt Stop, are wiſely contrived, both for the more eaſy Influx of theſe Liquors, and for a ſufficient Quantity of them being mixed with the Food, to perform well the neceſſary Offices for which they are deſigned in Digeſtion.

3. A pendulous Inteſtine here would, in our erect Poſture, have drawn the Stomach out of its due Situation, and might have twiſted or overſtretched the bilary and pancreatic Ducts, ſo as to have ſtopped the Courſe of the Liquors in them; and therefore it is ſo firmly tied down in its whole Courſe, that it cannot change its Situation.

The *Duodenum* of Brutes is likewiſe placed in ſuch a manner as to anſwer the ſame uſeful Purpoſes, though in many of them this Gut would appear to one who does not conſider the different Poſtures and way of Life of Animals, to be ſituated in an oppoſite manner to the human Body. To ſhew how general this Contrivance is, I ſhall curſorily mention a few Examples.

Apes,

Vol. IV

Fig 1.

Tab. 1

Fig 2

Apes, whoſe Poſture is for moſt part erect, or near ſo, have theſe Parts diſpoſed in near the ſame Way that Man has.

In *Dogs*, *Cats*, *Cows*, *Sheep*, and moſt other Quadrupedes whoſe Poſture is horizontal, the *Pylorus* and Beginning of the *Duodenum* are firmly connected to the Liver; after which a conſiderable Piece of Gut, with a Meſentery, hangs pendulous, and then the Gut is faſtned to the Loins and Backbone; therefore the pendulous Part muſt be loweſt in them. The bilary Duct opens into the *Duodenum* where it is tied to the Liver. The *Pancreas* is long, and lodged in the Meſentery along the pendulous Gut, and its Duct is near the Middle of that Gland.

Hens, *Ducks*, *Geeſe*, and other Fowls, whoſe Poſture of Body is neither erect nor horizontal, but oblique, have the Beginning of the firſt ſmall Gut well ſecured to the Liver, from which the Gut runs near to the *Podex*, and returns again to near the ſame Place where it began at, to be again tied to the Liver, all between theſe two Connections being pendulous. The *Pancreas* is fixed between theſe pendulous Parts, and its Ducts open into the Part of the Gut where it had returned back to the Liver, as the bilary Ducts alſo do, but with a Direction

ction opposite to the Course of the Aliment in the Gut. After the Entry of these Ducts, the Intestine runs a good Way along the concave Part of the Liver towards the membranous Diaphragm, being fixed to the Liver and to the Air-membrane which lines the Abdomen. At length the Gut makes a Curve to the right Side, and takes its Course toward the *Podex*.

In *Cod*, *Haddocks*, and such Fish, the *Cæcula*, which are esteemed analogous to the *Pancreas* of other Animals, surround the first Gut, soon after it comes from the Stomach, and then the Intestine is fastned to the Liver, where the bilary Ducts open into it.

I designedly here leave the Reader to follow out the same Contrivances in this comparative Anatomy as were mentioned in the human.

If then we consider what Quantities of different Substances enter the *Duodenum*; some of which have rough hard Parts, to rub violently on its Sides; others have sharp saline Particles, to prick and corrode; others are irritating rancid Oils; others, in their Digestion, generate great Quantities of distending Air; others, by their Moisture and watery Nature, are apt to relax the Fibres; others harden these Fibres too

too much: If, I ſay, we conſider this, we need not be ſurpriſed that this Gut, the *Duodenum*, ſhould be more ſubject to Maladies than any of the reſt; eſpecially that it has not ſuch a firm Covering of an external Membrane, to aſſiſt it to reſiſt the Forces overſtretching its Fibres, as the other Guts have. And if the Gut itſelf ſuffers, how ſoon muſt it diſturb many other Functions of the animal Oeconomy, by the Preſſure it may make, when overſtretched, upon ſo many large Veſſels, Nerves and other Organs, to which it is inſeparably contiguous, or by communicating its Afflictions to thoſe Parts which ſympathize with it, by means of the common Origin of their Nerves, or by ſtopping the Influx of theſe two abſolutely neceſſary Liquors, the bile and pancreatick Juice.

Any tolerable Account of Diſeaſes, from ſuch Cauſes as I have juſt now mentioned, would lead me far beyond the Bounds of any Eſſay you could admit of; and therefore I ſhall do no more than with *Santorini* (*a*) recommend to Practiſers, to have ſuch in their View, when they treat Patients who labour under Diſeaſes of the *Epigaſtric* or *Hypocondriac Regions*, that they may

(*a*) Obſerv. Anatom. cap. 9. § 7.

may not confound ſuch which have their Seat in this Gut with others which require very different Treatment. This is the more neceſſary, becauſe Authors generally take little or no Notice of the *Duodenum* as the Seat or Cauſe of any particular Diſeaſe.

XII. *Miſcellaneous Remarks on the* Inteſtines; *by the* ſame.

THE preceding Account of the *Duodenum* has called to my Remembrance ſome Remarks that are commonly neglected, which I think may be made on the other *Chylopoietic Viſcera*. If you are of Opinion they deſerve a Place in your Collection, you may tack them to the Deſcription of the *Duodenum*.

The Inteſtines are generally deſcribed as being covered all over with an external membranous Coat which is ſaid to be derived from the *Peritonæum*. But it ought to be remarked, that a conſiderable Part of the Circumference of the human Inteſtines is not covered with ſuch a Membrane: For the Meſentery being formed by the *Peritonæum* produced on each Side, and including

ding a considerable Quantity of cellular Substance, in which much Fat is frequently contained, together with the numerous *Glandulæ Vagæ*, the large meseraic Arteries and Veins, and the Nerves and Lacteals, and the fatty cellular Substance being thick, till after the Membrane of each Side is continued some Way upon the Gut, all the Space there between the Membranes, which is always more than the Distance between the Insertion of the Arteries that rise on each Side of the Gut, that is, a fourth at least of the Circumference of the Gut must have no such firm membranous Coat covering it; and therefore will more easily yield to any stretching Force, which may be of Use, in allowing the Guts to be more enlarged than otherwise they could be, without overstretching their Vessels.

It is in this Space between the Insertion of the Blood-vessels that the *longitudinal* Fibres of the Guts can be seen most distinctly and easily; because the cellular Substance is separated with little Trouble, or collapses so much, as not to hinder the View of the muscular Fibres under it: Whereas, in the Part of the Intestine opposite to the Mesentery, the external membranous Coat, whose Fibres are very like to those carnous ones, adheres so firmly to them, that it cannot easily

ſily be diſtinguiſhed or ſeparated from them.

I need ſcarce obſerve, that the *circular* Fibres of the Guts are often ſo interlaced, that one can ſcarce trace the ſame muſcular Fibre round the whole Gut.

It is now generally enough known, that all the Subſtance between the interior Side of the circular muſcular Fibres of the Guts and the villous Coat, which uſed to be divided into the *vaſcular*, *nervous* and *glandular* Coats, can, by blowing into a Piece of Gut whoſe interior Side is turned out, be raiſed into a *tunica cellularis*, with numerous Veſſels running every where thro' it, without any Fat in it, where however it would appear there is ſome Secretion performed; for, by injecting Water into the Arteries, theſe Cells are filled with it; and frequently, after making Injections of groſſer coloured Liquors, I ſee a Secretion performed, by the Cells being here and there diſtended with the white injected Subſtance, while the colouring Powder does not paſs with it, but is left behind. When this ſecreted Liquor hardens, it forms a Number of ſmall round or oblong Tubercles, which I have ſeen ſeveral willing to imagine were *Peyer*'s Glands filled with the Injection; and this *Ruyſch* (*a*) ſeemed likewiſe to think,

(*a*) Epiſtol. 11. reſponſ. & ſparſim.

think. I can't yet bring my ſelf to that Opinion, becauſe Water diffuſes itſelf ſo equally every where, and the Injections which harden do frequently the ſame for a large Space; at leaſt, theſe make it evident, that if *Peyer*'s Glands are ſometimes injected, there are alſo Veſſels which convey Liquors into this *internal cellular Membrane*, which may lead us into a more reaſonable Account of the very great Diſcharges of Mucus after an Excoriation of the Guts, and of the large extended hard Tubercles that are frequently ſeen within their muſcular Coats, and of ſeveral other Phænomena of Diſeaſes, than otherwiſe we could give.

In a Piece of Gut diſtended with Air in the Manner mentioned for demonſtrating its *internal cellular Coat*, we ſee the *villous Coat* in its membranous Form, and without the downy, papillous and mamillary Appearance which an inverted undiſtended Inteſtine floating in Water has.

Upon obſerving this *villous* Membrane when it is ſtretched, remarking how thin and flexible the *Cuticula* becomes upon the Lips, with the Continuation of the ſame Membrane in the Mouth, Tongue, *Fauces Oeſophagus*, Stomach, and inteſtinal Canal; and upon comparing the Properties which the

the moſt external common Covering of the Body has, with thoſe of this *villous* Membrane, we muſt be convinced they are very much of the ſame Kind, if not the ſame continued Subſtance. I do not know that all the Properties of the *Cuticle* have been conſidered by the Authors who deſcribe it, far leſs, that a Compariſon has been made between it and any of the internal Membranes, to ſhew their analogous Uſes and Advantages, therefore beg to be allowed to conſider them a little in this Way.

The *Cuticula* is notourly pervious to Liquors going out of the Body, and to others coming into it, ſo is the *villous Coat* of the Inteſtines, and both of them have other Paſſages through them, whereby they allow certain Subſtances to penetrate to the Nerves which they cover. Thus a Numneſs is brought on the Skin, by immerſing any part of the Body in ſeveral ſorts of Liquors, and Pain is raiſed by Subſtances which do not deſtroy the *Cuticle*; thus ſapid Objects affect our Tongue, and the different Senſations ariſe which we frequently feel from the Contents of the Stomach and Inteſtines.

The external *Epidermis*, by being expoſed to a Variety of different Forces acting upon it, is of very different Thickneſs and

Firm-

Firmneſs in ſeveral Parts; but it is naturally formed ſo flexible, as to allow a ſufficient Impreſſion of tangible Objects on the Nerves below it. The internal Membrane of the Guts is leſs expoſed to a Variety of ſuch Cauſes, and therefore is more uniform; but can be changed in the ſame Manner by like Cauſes: And hence frequently we find the interior Surface of the Stomach and Guts of a callous Hardneſs, and almoſt inſenſible, while for ordinary it is very ſenſible, and ſo flexible, that by being connected to ſuch a looſe cellular Subſtance as already deſcribed, it hangs floating, and aſſumes any Shape the contractile Fibres of theſe Cells give it, whether of large *Rugæ*, called *Valves*, or of ſmaller *Papillæ* of different Forms.

Thin watery ſaline Liquors waſh away the *Cuticula*; Thick mucaginous Subſtances protect it againſt them, and the bad Effects of Friction: Therefore, where-ever the *Cuticula* is expoſed to ſuch Injuries, its Defence is likewiſe provided. Thus the *Eye-lids* are defended againſt the Tears and their mutual Colliſion, by the *ſebaceous* Matter ſeparated in their Glands; the Nipples, Arm-pits, *Glans*, *Urethra*, *Perinæum*, *&c.* are all protected in the ſame Way. When their Defence is wanting, we

ſee the troubleſome Conſequences, Excoriation, Pain, Inflammation, &c. The *internal Membrane* of the Guts being more expoſed to the Action of watery Liquors, has a much more plentiful Supply of the protecting Liquors, and is always, in a ſound State, lined over with Mucus. Whenever therefore this Mucus is carried off too quickly, as in *Diarrhœæ* and *Dyſenteries*, or is not ſecerned in ſufficient Quantity, as in Inflammations, or other Obſtructions of the inteſtinal Veſſels, we may eaſily judge what the Conſequences muſt be, and are led to ſupply by Art what Nature then is deprived of.

A certain moderate Degree of Friction makes little or no Change upon the *Cuticula*, Nature eaſily ſupplying what is carried off. When it is greater, but gradual, and not ſo violent, as to deſtroy its Texture, or to ſeparate it from the Parts it is connected to, the Effect is not a little ſurpriſing; the *Cuticula* becomes thicker, ſtronger and firmer, as we ſee every Day in the Soles of the Feet, and in the Hands of labouring People. When ſudden violent Friction is applied to the *Cuticula*, either it is rubbed imperceptibly off, or it is ſeparated from the Skin; this daily Experience alſo ſhews every one. The *villous Coat* of the Inteſtines

ſtines is not expoſed to ſuch Accidents as the external Surface of the Body, and is better defended by the Slime from the bad Effects of rubbing Forces, while the Abraſion or Separation of this *villous* Coat may well paſs ſo unobſerved, that one cannot give Examples to prove Circumſtances in it analogous to thoſe mentioned in the *Cuticula*; the moſt ſurpriſing and leaſt to be accounted for Phænomenon, to wit, the thickning and hardning of the *Cuticula* by Friction, may however be alſo ſeen in the Inteſtines, when any hard concreted Subſtance is lodged a conſiderable Time in any particular Part of the Guts; for then the internal Surface of the Inteſtines becomes there thick and hard.

The *Epidermis* ſeems to ſerve for contracting the Extremities of the cutaneous Veſſels, probably by forming their Extremities; for whenever it is ſeparated, theſe Veſſels throw out their Liquors in much larger Quantities than ordinary. I know the Writers on this Subject generally expreſs themſelves in ſuch Words, as would perſwade their Readers they thought the cutaneous Liquors were all thrown out of their Veſſels between the *Skin* and *Cuticula*, and thence gradually eſcaped through the Interſtices of the cuticular Scales. But

if this was the Caſe, there would perpetual Bliſters be raiſed in the depending Parts of the Body, if not all over the Surface of it; and the Liquor in Bliſters would eſcape through theſe Interſtices; which it does not. The ſame Effuſion of Liquors is made into the Inteſtines, upon the Separation of the villous Coat, in the End of Conſumptions, and in other Diſeaſes, where the Tongue and Throat ſhew the excoriated State of the alimentary Canal.

When any Part of the *Cuticula* is ſeparated from the Skin, but ſtill is continued with the adherent *Scarf-skin*, it becomes thicker, eſpecially if ſoaked with Liquors: Thus the *Cuticle* of Bliſters, and what ſeparates from the Edges of Wounds and Ulcers, is frequently very thick. The ſame thing happens in the alimentary Tube, as is evident in *Aphthæ:* And this Obſervation only can account for the tubular thick Subſtances frequently voided at the *Anus*; which have been taken for Pieces of the Guts, becauſe of their Shape and Firmneſs.

The *Epidermis* is the moſt incorruptible and leaſt ſubject to Eroſion of any part of the Body. In Abſceſſes the *Pus* has little other Effect upon it, than to ſeparate it from the Skin, and to tear it by its Weight, but not to diſſolve it. In *Gangrenes* and *Sphæ-*

Sphaceli, it remains uncorrupted, after all that it covers is converted into a putrid Maſh; nay, it can allow the common *Lapis Septicus* to penetrate through it, and deſtroy the Parts below, without ſuffering a Solution of Union in its own Subſtance. Poſſibly this may be owing to its having no proper Veſſels or Liquors. Whatever the Reaſon of it is, it is certain the *tunica villoſa* of the Inteſtines enjoys the ſame Properties, which are of the utmoſt Advantage in both, conſidering how many Subſtances of different Natures are applied to them; ſome of which would certainly diſſolve them, if they were capable of Diſſolution, and would expoſe us to the Inconveniencies of Pain, Inflammation, Effuſion of Liquors, *&c.*

Becauſe theſe Membranes of which I have treated, though indiſſolvable, are however ſeparable from the Parts they cover, the Conſequences of which Separation are ſo bad, therefore they are the moſt eaſily and quickly regenerated of any Organs in the Body that are not of the ſame Structure.

Whoever calls to Remembrance the analogous Structure and Uſes of the moſt internal Coat of all the hollow *Viſcera*, of the Arteries, Veins, *&c.* will ſee that I point at concluding all of them of the ſame Na-

ture with those I have now insisted on.

I never saw the *Appendix Vermiformis* of any of the human Fœtuses which I have dissected, distended with *Meconium*; and therefore cannot allow it to serve as a *Reservoir* of the *Fæces* during Gestation, which several Authors have imagined; but must join with those who assign it the Use of furnishing *Mucus* to lubricate the internal Surface of the *Great Sac* of the *Colon*, and to moisten the *Fæces* in it, that they may more easily be pushed forward out of this part of the Gut where there is the greatest Difficulty in their Progress, and where, by stagnating too long, they may bring on troublesome Symptoms; witness the Disease called *Placenta intestinalis* in Women with Child, which I have seen more than once in Hazard of being mistaken for some other Disease, that required a very opposite Method of Cure to what ought to have been used. The numerous *mucous Lacunæ* observable in the human *Appendix*, and the like Structure in the *Cæca* of Brutes, are Proof enough of the *Appendix* serving the Use mentioned, both in the human Fœtus and Adults.

It will be said, that the *Appendix* being so much proportionally larger in the Fœtus than

than the Adult, ſeems to indicate ſome other Uſe it is alſo of to the Fœtus. But this proportional leſſer Size of this little Gut in an Adult will appear to depend upon the Preſſure it ſuffers, and being emptied ſo frequently of its Contents; whereas in a Fœtus there is no Reſpiration to ſqueeze it, and the *Meconium* in the *Sac* of the *Colon* prevents its being emptied; ſo that the Liquor ſeparated by its Glands being collected there, ſoftens and relaxes its Fibres, and diſtends it.

The Neglect of conſidering what the different Forces are, which act upon the ſeveral Organs of the Body, while in a Fœtus-ſtate, and after Birth, has, in my Opinion, contributed to many Diſputes, which might eaſily have been put an End to, by accounting for the Phænomena, which were the Subject of them, in this Way of Reaſoning. I ſhall mention one remarkable Difference in the Circulation of the Blood, and ſome few Conſequences from it.

Though the Heart and Arteries of Animals are able, by their Action, to keep up a Circulation in the larger Veſſels, yet, without Aſſiſtance from ſome other Powers, they cannot propel the Liquors with Velocity enough, and in ſufficient Quantity,

through the ſmall Veſſels. Theſe aſſiſting Powers, after Birth, are the alternate Preſſure of Reſpiration, and the Actions of the Muſcles. We can obſerve at any Time how much the Circulation is quickned, by encreaſing theſe; and on the contrary, how much all the ſecerning Organs are infarcted and ſtretched by their almoſt ſtagnating Fluids, whenever one of them, muſcular Motion, to wit, is little exerciſed. Thus Creatures turn fat when they have not Exerciſe. Hence a Recruit of all the neceſſary Liquors in Time of Sleep. Hence the ſtrong ſlow Pulſe of ſleeping People. Hence the Deſire of continuing Sleep, after a Perſon has ſlept beyond his ordinary Time. Hence the ſmall Waſte of ſuch Creatures that continue long in a dormant Condition, without any Supply of Food. Hence a dry parched Mouth in the Morning, which is ſoon relieved by chewing. Hence a Stiffneſs and Lazineſs after abſtaining from Exerciſe too long. And a great many other Phænomena, which will occur to any upon the leaſt Reflection.

Since then the Heart and Arteries of Fœtuſes have little or no Aſſiſtance from any alternate Preſſure, in propelling their Liquors, their ſecerning Organs, (where, of all the Parts of the Body, there is the greateſt

eſt Complication of Veſſels, divided into the ſmalleſt Ramifications, with the leaſt Firmneſs, and conſequently Reſiſtance, in their Solids) muſt all be infarcted and diſtended, and therefore of a larger proportional Size than in the Adult, as we ſee their Brains, Liver, Pancreas, Kidneys, Breaſts, *&c.* are. So that the *Thymus* and *Glandulæ Renales*, about which ſo much Enquiry has been made, have ſo far nothing but what is common to other glandular Parts.

It probably will be alledged that the *Thymus* and *Glandulæ Renales* loſe more of their proportional Size in the Adult than the other Organs named: Admitting this generally-received Fact, though upon comparing them with the Brain, and ſome others, I doubt it ought not to be admitted as commonly ſtated. Admitting, I ſay, this Fact, it will not bring us under any Neceſſity of being obliged to ſearch out ſome particular Uſe they ſerve in the Fœtus: For a View of their Circumſtances, as to Situation and Preſſure, will account for all the Differences obſervable in them. To underſtand this aright, it may not be amiſs previouſly to conſider one or two Cauſes that may influence the Growth of animal Organs.

1. then, It will not, I believe, be denied, that

that the Growth of the Parts of the Body will be greateſt where they are leaſt confined, and leaſt expoſed to preſſing Forces. The *Brain* is at firſt incloſed in Membranes, and is prodigiouſly large, in proportion to the other Members; as the Bones of the Skull become firm, its proportional Size diminiſhes; and after they are fully joined, its proportional Increaſe is very little. The *Teſticles*, on the contrary, are at firſt confined within the Abdomen, and very ſmall; afterwards, when they fall down into the looſe Bag, the *Scrotum*, they increaſe much faſter.

2. The greater the Force is with which our Fluids are thrown into Parts, or the greater the Reſiſtance is, to the ſecerned, or to the returning Liquors, whether that Reſiſtance is owing to external Preſſure, Smalneſs, or unfavourable Situation of the Veſſels, or to the Viſcidity of the Fluid, *cæteris paribus*, the Bulk of a Part will be increaſed. A Hand ſwells, upon preſſing the Veins of the Arm. A Tumor in the *Urethra*, near the *Caput Gallinaginis*, occaſions a Swelling of the *Teſticles*.

To apply theſe Principles to the *Thymus* and *Glandulæ Renales*, we need only call to our Remembrance the Situation of the one, in the double *Mediaſtinum*, between the

the Heart with its large Veſſels, and the *Sternum*, with the Lungs on each Side. The other lies on the muſcular Appendix of the Diaphragm, covered before by the chylopoietic Organs. Neither of them have any excretory Canal, except the lymphatic Veſſels are eſteemed ſuch. The Veins of both have a ſhort Courſe, and that of the *Glandulæ Renales* is remarkably large.

The greater Preſſure which the *Thymus* ſuffers after Birth, from the increaſed Action of the Heart and of the Lungs, is altogether evident. The immediate Play of the *Diaphragm* upon the other, ſhews as evidently that there are ſcarce any glandular Parts in the Body, the Change upon which, as to Preſſure, is greater after Birth, to what it was before, than in theſe two; and therefore, by our firſt *Propoſition*, they ſhould ſuffer in their Growth upon this Account. But to this is to be added the Thinneſs of the Fluids ſent from them, and their ſhort Courſe in large Veſſels, which are almoſt peculiar to them; by which their Veſſels muſt be leſs diſtended, and conſequently their Increaſe leſs, by *Propoſition* 2.

Having endeavoured thus to account for the leſſer proportional Size of theſe Organs in the Adult, I would join in Opinion with

thoſe

thoſe Gentlemen, who aſſign them the Office of lymphatic Glands, both before and after Birth, ſerving to dilute the Chyle and thick Blood that is ſoon after to be returned to the Heart.

Having thus exerciſed the common Privilege Miſcellany Writers aſſume to themſelves, of digreſſing at pleaſure, I chuſe to conclude with a Subject ſomething nearer to what I began with.

At the Part of the *Meſocolon*, which connects the ſigmoid Flexure of the Colon near the left Cavity of the Ilia, where in moſt adult Bodies there is an *Infundibiliform Cul de Sac*, or *Thimble-like* Cavity, I could never obſerve in Children more than one Part of the *Meſocolon* laid over the other, becauſe of the great Flexure of the Gut at this Place; and therefore conclude the Cavity to be accidentally formed, by the growing together of the contiguous Parts of the *Meſocolon:* And that it is as needleſs to aſſign Uſes to it, as it would be to ſhew how uſeful the Concretion of the Lungs and *Pleura* is, which ſeldom miſſes to be obſerved greater or leſs in adult Bodies.

XIII. *Ob-*

XIII. *Observations concerning the* Placenta, *the two Cavities of the* Uterus *and* Ruyſch's *Muſcle* in fundo uteri; *by Dr.* THOMAS SIMSON, Chandos *Profeſſor of Medicine at St.* Andrew's: *In a Letter to Dr.* John Pringle, *Phyſician, and Profeſſor of Ethicks in the Univerſity of* Edinburgh.

SIR,

YOU know I had come to ſuch a Reſolution in publiſhing a new Edition of my Treatiſe of the *Uterus*, as to make publick Advertiſement of it: But upon a fuller Conſideration of that Part which related to the *Practice*, finding it deficient in ſeveral material Points, which I have ſome Hopes of making more compleat from further *Obſervations*; I perſwaded my ſelf to delay the Publication for ſome Time. But that I might make ſome Atonement for my Delay, reſolved to lay before the *Society* with you for collecting *Medical Eſſays*, ſome of the *Improvements* I had made in the Theorical or Anatomical Part, reckoning that ſuch Things cannot be too ſoon publiſhed,

bliſhed, to give Opportunity to ſuch as have a Variety of Subjects, to examine into what is alledged; which is the more neceſſary as to my Doctrine, becauſe the Subjects that can be ſerviceable for this End are the worſt of all to be had, and in a ſmall Proportion to thoſe that in general are ſubſervient to Anatomy: I was obliged in what I have advanced, to have Recourſe to the ſtanding Obſervations of Anatomiſts, many of which had hitherto never been employed to ſolve any Queſtions relating to the animal Oeconomy; and I hope the Way that I have collated them, and the Concluſions I have drawn from them, when conſidered conjunctly, ſhall ſhew the Uſefulneſs of inſiſting upon particular Obſervations, in order to the making out of Syſtems. Except we take this Way, all our Theories ſhall be mere Hypotheſes: But by full Collections of Obſervations, we may come to ſolve the moſt intricate Problems.

The Example I am to give you, is in finding out the true Riſe of the *Placenta*, and the Deſign of dividing the *Uterus* into two Cavities, which we find the Antients did not ſo much as attend to; at leaſt *Fallopius* ſeems to have been the firſt who deſigned them by different Names; and, by ſo doing, has given Occaſion to the later Anatomiſts

tomiſts to make a great many particular Obſervations as to their Structure, and to me, if I miſtake it not, of their Uſe. It was the Variation that is obſervable in the Poſition of the umbilical Cord that gave the firſt Riſe to my Scheme, upon which I built the moſt of my Theory upon this Head in my Syſtem: But ſince, a great many other Arguments have ariſen to me from different Topicks, eſpecially from comparative Anatomy, as you will find in the Sequel.

It has been hitherto generally received, that the *Placenta* is an original Part amongſt the Secundines. But to me, from collating Obſervations, it ſeems to have no Place in the *Ovarium*, nor in the *Uterus*, till once the *Ovum* becomes contiguous to the *Fundus*; at which Time every Part contiguous becomes really *Placenta*, which is the whole of the *Chorion*, except that ſmall Portion that lies contiguous to the *Cervix*: So that, according to my Doctrine, at firſt the *Placenta* involves the whole *Embryo*, except ſo much as is contiguous to the Paſſage from the *Fundus* to the *Cervix*, where ſometimes one Part and ſometimes another of the *Ovum* happens to fix; and conſequently ſometimes one Part and ſometimes another is *Placenta*, which

is

is vaſtly larger than the membranous Part at its firſt Appearance. Such a Phænomenon as this could not have eſcaped the Attention of the anatomical *Inveſtigator*, if he had not been prejudiced with the Notion, that the *Placenta*, at its firſt Appearance, ſhould have ſomewhat of that Proportion to the other Parts of the Secundines which it has at the Birth. The celebrated *Ruyſch* ſeems ſo prejudiced with this Notion, that he could not believe his own Eyes that the *Placenta* was ſo large at its firſt Appearance, as he found in every Caſe, except one; and therefore forced himſelf into the Conceit, that what then appeared as *Placenta* round the whole *Embryo*, was nothing but a Coat of Blood coagulated round it; though he is ſo juſt as to own, that this Blood was ſo involved with the *Placenta* that he could not ſeparate them without Violence to the *Placenta* (*a*). Dr. *Harvey*'s Account of the Envelopments of the *Embryo* was leſs diſguiſed, who tells us, That their external Surface was all over wringled, and daubed over with a Kind of gelly or glutinous Subſtance, without any Appearance of the *After-Burden* (*b*); that is, of an After-Burden diſtinguiſhed from the

(*a*) Obſerv. Decas 2. Obſerv. 10. Theſ. 6, num. 40.
(*b*) De Generat. Diſſert. 69.

the other Integuments, as in the laſt Months. And indeed amongſt moſt of our more curious Obſervators, we find a like Undiſtinctneſs in their Account of the Involopments at that Time. I ſhall in *Zanottus*'s Words give an Inſtance in a Hiſtory from *Galeatius*, as *Zanottus* has given it, where he treats *de inſtituto & Academia Bononienſi. Diſſectâ muliere, quam ſecundo circiter graviditatis menſe febris oppreſſerat, uterum cum ovariis & tubis continuo Galeatius extraxit, ſcire cupiens, quemadmodum hæc haberent. Uterus ſic erat. Placenta ejus fundo ſatis firmiter adnectebatur, quamquam adhuc erat informis; nihil, quod fœtum profiteretur, apparuit; tantum ſacculus ſe prodidit carneæ cuidam maſſæ, quam vix à Placenta diſtinguiſſes, adhærens, apertumne dicam per longum an laceratum? Id Galeatio aliiſque cum eo idem contuentibus ſuſpicionem injecit, vel mulierem nihil perfectum concepiſſe, vel fœtum, ſi quem conceperat, ante ejus obitum ex illo clauſtro exceſſiſſe.* The beſt Commentary to this Hiſtory is a Caſe I had occaſion to examine, when occaſionally at *Coventry*, where a Lady of my Acquaintance miſcarried about the third Month, with a great Effuſion of the *Lochia*; which gave me Reaſon to ſuſpect,

that the After-Burden was ſome Time looſe in the *Uterus* before it was diſcharged: The whole Conception was about the Bigneſs of a Gooſe-Egg, and uniform through its external Surface, which had ſomewhat the Appearance of a gelatinous Subſtance, as *Harvey* obſerves: But ſcraping upon this, I found it much of the ſame fibrous thick Texture as the After-Burden in the laſt Months, till I came as far as the *Chorion*, from whence I ſcraped the fibrous Part all round, ſo as to leave it a pure clean Membrane, ſuch as what *Ruyſch* mentions as the only Inſtance where he did not find the *Placenta* involved with Blood; which, I think, gives juſt Ground to ſuſpect, that the fibrous Part had been ſome how or other torn off, which is not difficult to do in that tender State. When I came to the membranous Part, I ſaw diſtinctly the fibrous Part every where inſerted into it; nor did I, through the whole Circumference, find the leaſt Difference as to the Manner the fibrous Part was attached to the *Membranous*, ſo as to ſuſpect one Part for *Placenta* more than another: Only at one Part I found a ſmall Slit that led into the membranous Bag into which the Shoulders of an apoſteme Lancet would have had Difficulty to have entred. When I opened the

the Bag fully, there was nothing in it of *Fœtus* or Humour; only to one Part I found hanging about an Inch of the umbilical Cord: But though I ſhewed this to the Midwife and other By-ſtanders, and argued from it, that there had certainly been a *Fœtus* there, but that it had been ſqueezed in the Time of Labour through the obſervable Slit, I could not prevent its paſſing abroad that the Lady had been with a falſe Conception; the whole Appearance and the Want of an Embryo ſatisfying them upon that Head: But to me it gave a very diſtinct Notion of *Galeatius*'s Caſe; of his *Sacculus*, and adhering fleſhy Subſtance, which he could not diſtinguiſh from the *Placenta*, and that the Embryo had certainly been ſqueezed, as in my Caſe, through the Aperture found in the Conception. How theſe Apertures happen, ſo as to allow the ſmall Embryo to paſs them (which we may ſuppoſe to take place frequently, ſince *Ruyſch* tells us the Embryo is frequently amiſſing, *Theſ.* vi. *num.* 81.) may eaſily be underſtood upon my Hypotheſis, that the Part of the Secundines next to the *Cervix*, where they are not contiguous to the *Fundus*, keeps always membranous, and has nothing to ſupport it; ſo that it muſt eaſily yield, and being deſtroyed, the

Part that it covered muſt appear only as a Slit: But this will be more manifeſt in the Sequel of our Treatiſe. *Heiſter*, in the fourth Edition of his Anatomy, has given us the moſt diſtinct Account of this Affair, as you will find in the 27th *Figure*, where he has elegantly repreſented a *Fœtus* about three Months, included in its Integuments: In his Explanation of this Figure he tells us, that the Conception was almoſt quite ſurrounded with ſuch a Set of vaſcular Fibres, as he has repreſented in the lateral and under Margin of his Figure; but that he had ſcraped ſo much of them off, as to let us have a View of a *Fœtus* through the membranous Part. This Conception of *Heiſter*'s ſeems to have every Thing in its natural State; whereas, for moſt part, theſe early Conceptions are more diſguiſed, by lying longer in the *Uterus*, or being more ſqueezed when diſcharged; and thus they are found frequently without the Embryo, and having the fibrous Excreſcencies obliterated: So that *Ruyſch* could take them for clotted Blood; and to *Harvey* they appeared like ſo much Gelly: Which was the external Appearance of the Inſtance I mentioned; though, as I ſaid, in ſcraping into it, the fibrous or vaſcular Part was moſt diſtinct. *De Graaf*, toward the End of his

his 15th Chapter, ſpeaks of the ſame maſſy Appearance of the external Integuments of the more early Embryo's, as what is ordinarily to be obſerved, and look'd upon it as preternatural; while he tells us, that others reckoned them to be *Mola's*: Which, according to *la Motte*'s Opinion, has no membranous Cover, has no Embryo, nor any Thing like an After-Burden (*a*). I ſuppoſe, from the Hiſtories I have given, and the Light I have ſet them in, the Ground of their Miſtakes, and this Definition of *la Motte*'s may be eaſily ſeen into. All theſe Caſes are *Mola's* with *la Motte*, where the ſmall membranous Part is torn, and the Water and Embryo diſcharged; which happens moſt frequently: And I miſtake it, if this has not given Ground to the Numbers of *Mola's* we have recorded amongſt Obſervators, who are very copious upon this Subject, and has given occaſion of their being diſtinctly treated of by every Writer almoſt in Midwifery, who have given us very ſtrange Accounts of them; ſuch as have frequently diſtracted the poor Woman, and put her to much Trouble and Expence: While the Practitioner took his Indication from ſuch an Appearance, to put her under a ſe-

(*a*) Des accouchements liv. 1. obſ. 3.

vere *Regimen* and Courſe of Drugs, to purge the *Uterus*, from whoſe bad State they deduce the Riſe of the *Mola*.

As we have the concurring Teſtimony of almoſt all Obſervators as to the ſurrounding of the Embryo in the two or three firſt Months with the *Placenta*, though ſomewhat diſguiſed: So after this it is agreed upon, that the *Placenta* has ſtill a leſſer Proportion to the membranous Part of the Integuments, the nearer they come to the ninth Month. Thus *Blaſius*, in the firſt of his *Anatomical Obſervations*, takes Notice, That the *Placenta* covered the whole of the Embryo in the fourth Month, excepting a Space that could be covered with a Crown. In this the *Placenta* had much the Appearance as in *Heiſter*'s Figure, according as *Blaſius* deſcribes it; and the Extent of the *Placenta*, and its Proportion to the membranous Part is agreeable to *Ruyſch*'s Repreſentations. I had Occaſion lately to ſee a Miſcarriage of Twins, the firſt of which came away withouts its Integuments, and the other with them, all intire, in the midſt of the Waters, alive, tho' but of five Months, as I gueſs'd from their Bigneſs, and as the Mother reckoned in her uſual way of Computation. In both, the *Placenta* was much of the ſame Extent with

with the membranous Part, and not much inferior to what I uſually find it at full Growth in the ninth Month: So that for the four laſt Months the Growth of the *Placenta* is very obſcure, but that of the membranous Part very conſiderable, being at leaſt five Times larger than the *Placenta* at that Time, as may be reckoned from the Bulk of the Infant, and Waters it ſurrounds; which is the only way we have to judge of them in the laſt Months, when the Integuments ſeldom come away intire.

When we look into theſe Hiſtories then, every where to be met with, which ſhew us that the Embryo is wholly ſurrounded with the *Placenta* in the firſt Months, we cannot doubt of what I aſſerted at the Beginning of this Chapter, that the whole exterior Surface of the *Ovum* that at firſt is contiguous to the Cavity of the *Fundus*, is in fact *Placenta:* But this being a new Doctrine that will require to have our Arguments ſet in different Lights, to convince the prejudiced Mind, I ſhall conſider the Riſe of the *Placenta* in other Animals; for I find in this Caſe, as in a great many other Inſtances, comparative Anatomy contributes a great deal to form our Judgment.

In Animals where the *Ovum* has its Supplies by Mediation of *Cotyledons*, which

are original Parts in the *Uterus* or its Horns (*a*), nothing can be more evident than that ſuch Parts of the *Chorion*, or exterior Surface of the *Ovum*, becomes *Caruncle* or *Placenta*, as comes in Contact with the Cotyledons, and theſe only: For Example in the Hind, in whoſe *Uterus Harvey* takes notice of 10 Cotyledons, 5 on each Side, there are exactly ſo many Caruncles upon the Chorion, and of the ſame Extent and Figure; and in Sheep and Cows, which we have Occaſion to ſee every Day, and round whoſe Chorion *Needham* has ſometimes found 60, 70, 80 Cotyledons, the Caruncles always correſpond in Number and Shape; and that even in Cows, who at former Calvings had loſt many of their original Cotyledons, which they frequently do: Than which nothing can give us greater Evidence that the Caruncle is produced upon the Chorion by the Influence of the Cotyledon. But further, in Mares and Swine all the Time the *Ovum* keeps diſengaged from the *Uterus*, which it does for more than half the Time it is there, nothing fibrous or like a Caruncle appears upon the Chorion; nor do the Cotyledons appear, but upon the Conception coming in Contact with the *Uterus*, the Coty-

(*a*) Ad finem Theſ. 5. Articul. 3. Ruyſch.

Cotyledons appear, though but ſmall, and Caruncles anſwering to them (*a*). The ſame thing holds in thoſe Animals, who have particular Cells alongſt the Horns for receiving and nouriſhing the *Ovum*; ſuch as Rats and Mice, in which the *Ovum* is joined to the Cell by Mediation of one *Cotyledon*; upon their Invelopments there is but one Caruncle exactly ſhaped like the Cotyledon: But in Dogs and Cats, and ſuch like, where there is a particular Cell fitted for the *Ovum*, without the Mediation of a Cotyledon, the *Placenta* is exactly of the ſhape of the Cell, which is a cylindrical Portion of a cylindrical Tube; and the Cell being open at both Ends, the membranous Part extends itſelf to them: So that in theſe Creatures the *Placenta* appears as a Belt round the Chorion. And as in the Separation of the human *Placenta*, Blood always appears; ſo it does in them upon that Occaſion, but not in Animals with Cotyledons, except the Cotyledons be brought away with the Caruncles, as I have ſeen frequently in Cows: So that there is no doubt but the Cells, in which the *Ovum* fixes without Cotyledons, are prepared for the Engraftment of the *Ovum*, in the ſame manner

(*a*) Needham embriotomia.

ner as is the *Fundus* of the human *Uterus*; since, as in them, all becomes *Placenta*, contiguous to the Cells, and that Part membranous which extends beyond them. And thus we find in all Animals who as yet have come under our Consideration, that it is manifest that the fibrous Part of the *Secundines* or *Placenta* is owing to the Soil; and that Nature has been solicitous to have a proper Soil for such a Production in every Animal, though she has taken a different way to prepare it.

But though what I have now advanced gives the strongest Evidence for this Doctrine, yet there are other material Considerations which add to the Beauty and Force of our Arguments: For this is the peculiar Excellency of Truth, that upon whatever Side you view it, it appears uniform and of a Piece; and the more it is examined, it appears with the greater Simplicity and Symmetry. By this Doctrine of ours, by which we determine the whole of the *Ovum* to become *Placenta*. which is contiguous at first to the Cavity we call the *Fundus Uteri*, it of Necessity follows, that when two or more *Ova* arrive at once at that Cavity, that all their *Placenta's* will be confined to it, and consequently amongst them will only take up the Space ordinarily possessed

ſed by one; and all of them being contiguous and taken together, will be of the Shape that the ſingle *Placenta* has. This is a neceſſary Conſequence of what we have formerly advanced, and I refer to all Practitioners in Midwifery, if in Births where there are more than one at a Time, they do not find either all the *Placenta's* together, or certain Marks of their having been contiguous in the Form I aſſerted; only that between them they make a larger *Placenta* than what we find in caſe of a ſingle Birth: For every Part concerned, when Twins are produced, being extended more than in ſingle Births, it is but juſt to allow that the *Fundus*, with the *Placenta* or *Placenta's*, is ſo likewiſe. In the Caſe of Twins I mentioned before, where I was preſent after the Miſcarriage, I obſerved the Place where the Two had been contiguous, as evidently as we ſee the correſponding Sides of two Kernels that are contiguous in one Shell; Nay further, I evidently ſaw Marks of their being torn away from one another by Violence, the mutual Parts of Contact in both being evidently torn. In others I conſidered this in, when the Infants had come to their full Time, though I ſaw not ſo much the Marks of Violence, yet I eaſily diſcerned the Sides of the *Placenta's* that had been

been contiguous: But Instances, where they come away separate, are not so frequent as those where they come away still united, as *Deventer* has observed in his Chapter *de geminis pravè versis*, and every one may observe. But it is still more curious to observe how this holds where there are three or four Children at a Birth, of which we want not Examples. Thus *la Motte*, in the 42d Chapter of his Book we formerly cited, has two Instances of Three at a Birth; in one of which the *Placenta's* were all joined together as one; and in the second, two were joined; and the third came away by itself. Mr. *Saviard* in his *Nouveau recueil d'Observations*, *num.* 82, gives us two Examples exactly parallel. *Vieussens* in his Treatise upon the *Uterus*, tells us, That Messrs. *Codonian* and *Olavier* shewed him an Instance where the three were in one, though their Boundaries were most distinct. But what is still more observable, *Luca Shræckius* gives us a distinct Account in the *Miscell. n. curios. dec.* II. *ann.* 2. *observ.* 9. *p.* 26. of Four produced at a Birth by the Wife of one *James Thomas*, all of whose *Placenta's* were combined as one; tho' he takes notice that they were separate by certain Furrows into four Parts, each of which had an umbilical Cord

insert

inſert into it, which is always the Caſe when different *Placenta's* are thus combined. Now what Account can be given of ſuch a Phænomenon as this, from the common Hypotheſis, that the *Placenta* is an original Part in the Secundines, and is fixed only to a certain Place of the *Fundus*? What ſtrange Chance is it, that the four *Placenta's* ſhould meet ſo neatly, as to have the Appearance of one ſingle *Placenta*? If we ſhould ſuppoſe but two, it would even in that Caſe be a great Chance if they ſhould meet, becauſe the Membranous Part is ſuppoſed greater than the fibrous; and then, if they did meet, it ſhould only be as two Circles in a Point; whereas in Fact they are joined the whole Length of one of their Diameters. So that the whole Circumſtances argue for what I advance, that the *Fundus Uteri* is of ſuch a Virtue, that every Part of the *Ovum* that lies next it becomes *Placenta*; and if at once there are received two, three or four *Ova*, then ſo much of every one as touches the *Fundus* becomes *Placenta*; and of Neceſſity all the *Placenta's* muſt be contiguous, they filling up the Cavity of the *Fundus* exactly amongſt them: For whether there are more or fewer, they are confined here, having their Exiſtence from it. And as by the Light I have ſet the

Pla-

Placenta in, we ſee how the *Placenta's* are always ſo crowded together, when there are more than one at a Birth, ſo from it we come to underſtand how, in Caſes where there are but one, as well as where there are more, the Place of the *Placenta* into which the umbilical Cord is inſert, ſhould be altogether uncertain; that is, that the Cord ſhould be found ſometimes near the Circumference, ſometimes at the Center, and again, at very different Parts of the *Area*; as I every Day obſerve, and as *Ruyſch* has given us to know, in a Variety of Examples. By our Doctrine, the Phænomenon is inevitable; for the *Ovum*, with the Embryo attached to it, landing at the *Fundus*, that Part of it into which the umbilical Cord is inſert, will anſwer ſometimes to one Part of the *Fundus*, and ſometimes to another, there being nothing to determine the looſe Egg into one Poſture there more than another. If we ſuppoſe then that the Part of the *Ovum* into which the Cord is inſert, fixed at the moſt vertical Part of the *Fundus*, and that all of it becomes *Placenta* contiguous to the *Fundus*, then it is plain, in that Caſe, that the Cord will be found at the Center of the *Placenta*. But if we ſhall ſuppoſe, that the Part of the *Ovum* with the Cord fixes near

to

to the Boundary of the *Fundus* and *Cervix*, then of Neceſſity the Cord is at the Circumference; as I have ſeen it ſeveral Times, and in one Caſe of Twins, where the *Placenta's* were unite, both Cords were inſert within half an Inch of the Circumference of their *Placenta's*. I have ſeen it in a Variety of Places of the *Area* different from the Center; in which Caſes, the Inſertion of the Cord had got a different Place of the *Fundus* to ſettle in from the other two. So that all theſe Phænomena become moſt plain and intelligible, upon admitting our Hypotheſis, and are moſt certain Proofs of its Authentickneſs.

There is one Thing follows upon this Doctrine, which perhaps will be ſomewhat debated, and that is, that *extra-uterine* Conceptions can have no *Placenta*. I have conſulted Authors upon this; nor can I get any Inſtances to the contrary: They indeed ſpeak, as if they had no Doubt but they ſhould have had them. But this ſeems to have ariſen wholly from Prejudice; for upon examining into the diſtincteſt Caſes, we have no Ground to reckon that they had. Thus *Cyprianus* tells us, in the famous Hiſtory he gives us, where he ſaved a Woman with an *extra-uterine Fœtus*, that the *Placenta* was dried up, and become

come membranous; ſo that in Fact there was no *Placenta* found at all, that Hypotheſis of the Author's, of its drying up, being gone into, only to account for the want of a Part which he reckoned eſſential amongſt the Secundines, wherever found. *Sanctorinus* ſeemed likewiſe at a loſs about the *Placenta* of the *Tubarian Fœtus*, which he gives the Hiſtory of amongſt his Obſervations; in ſurveying which, he tells us, that he met with ſomething *Placentæ ſimile*; and in his Deſcription of his Figure, he ſays, *effuſa membranis adhærebat*. So that nothing can be concluded of a true *Placenta's* being there, though he reckons the *Embryo* to have been near the fifth Month. Nor could I get any greater Satisfaction in any Caſe I examined. So that what I have yet met with upon this Head, rather confirms my Doctrine than oppoſes it, that the *Fundus Uteri* is a Place peculiarly fitted for the Growth of the *Placenta*, as well fitted Soils encourage the Growth of the Roots of Trees and Shrubs, many of which are propagated by the Branches, however placed; ſo that every Part of them ſeems equally fitted to be Root or Branch.

Againſt this Doctrine, of every Part of the Chorion becoming *Placenta* that is con-

contiguous to the *Fundus*, it may be urged, that ſometimes in the Middle of the *Placenta* there have been found membranous Portions, ſuch as in that Inſtance *Rohault* mentions, in the Memoirs of the *French* Academy *Anno* 1715; like to which I ſaw another in the Cuſtody of the ingenious Dr. *James Douglas*, who has not a little ſupported the Credit of his Country, by his anatomical Diſcoveries. But ſuch Examples as theſe, in my Opinion, rather add than detract from the Force of my Arguments; ſince by them it would appear, that what is *Placenta* was originally membranous, which in theſe Caſes was not changed from ſome bad Diſpoſition of the Chorion or *Uterus*.

I muſt next conſider whence the Cavity is formed, which in the laſt Months contains the Infant, the greateſt Share of the Waters, and all the Secundines, except the *Placenta*: For ſince, by our Doctrine, the *Placenta* poſſeſſes all the *Fundus*, the reſt of the Cavity, which contains the other Parts, muſt ariſe and have its Formation from ſome other Part; concerning which, we need not be at any great Loſs, ſince the *Uterus* has, contiguous to the *Fundus*, another Cavity, which, agreeable to the Name now received, we call the *Cervix*; contiguous to which we obſerved the *O-*

vum membranous. So that, since the *Fundus* does not distend beyond what we find the Extent of the *Placenta*, the rest of the Cavity at the last Months must arise from the *Cervix*: And agreeable to this, we find, that then the *Os Tincæ* opens immediately into one uniform Cavity, where *Cervix* and *Fundus* are confounded together. And thus, in *Deventer*'s Figure of the *Uterus* immediately after Child-bed, the *Uterus* is drawn of a globular Shape, comprehending both *Fundus* and *Cervix*; and from what *Vesalius*, *Ruysch* and *Deventer* observe, concerning the Position of the round Ligaments and Tubes of the *Uterus* (*a*) in the first and last Months, it is manifest that the *Uterus* does not distend equally in all its Parts: For not only these Appendices of the *Uterus* keep very near to the *Os Tincæ*, so that the greatest part of the Bulk of the *Uterus* is above them towards the last Months, but those upon the one Side are much lower than their Neighbours upon the other Side, as we may observe in *Deventer*'s Figure. So that we must suppose the *Uterus* to extend sometimes to one Side more than to another. And from this it must follow, that sometimes the *Placenta* will be found in

(*a*) Vesal. lib. 5. cap. 15. Ruysch. Thes. 8. n. 3. not. 2. Deventr. ars obstetr. cap. 9. fig. 4.

in one Place of the Cavity, and ſometimes at another; and not as *Ruyſch* and *Deventer* maintain, that it is always fixed at the vertical Part, reckoning that the Inclination of the *Uterus* to a Side deceived thoſe who thought otherwiſe. But in an *Uterus* I ſaw with Dr. *Douglas* I mentioned formerly, where the Secundines were ſtill *in ſitu*, the *Placenta* was wholly to a Side; which gave me a certain Proof againſt their Authority I had formerly relied upon. But however inconſtant the *Uterus* be, as to the Manner of its Diſtenſion, this is certain, that the *Placenta* inviolably adheres to the Cavity of the *Fundus*; with this it is ingraft, and can never again ſhift its Place. And therefore, as we allow that the *Placenta* is found ſometimes in the lateral Parts of the *Uterus*, ſo it is a Sign that the *Uterus* has diſtended much more on one Side than another: And this ſeems very much confirmed by the Obſervation of ſuch as have been frequently pregnant; few of which there are, but who have been ſenſible that the Bulk of the *Uterus*, in one Courſe of Pregnancy, has had a very different Situation from what it has had at another.

That long-experienced Anatomiſt Mr. *Ruyſch*, in examining into the Structure of

the Part into which the *Placenta* was fixed, found, that there the Fibres ran in ſomething of a circular Courſe, and were ſome-how centrical one with another; and theſe he reckons were placed at the *Fundus Uteri*. But he ſeems to take the *Fundus* there in a different Senſe from what we have done all along; he meaning by it nothing elſe than the uppermoſt and moſt vertical Part of the Capacity of the *Uterus*, when in its enlarged State: Whereas we ſtrictly underſtand by it, that Cavity *Morgagni* deſcribed under that Name, in his third Figure of the firſt of his *Adverſaria*, we formerly cited. And by what we have advanced, we reckoned it demonſtrated, that this *Fundus*, in its whole Extent, makes up what *Ruyſch* called his *Muſculus Uterinus*, this being the Part to which the *Placenta* infallibly adheres in all Caſes: So that what *Ruyſch* obſerved of the circular Courſe and centrical Poſition of theſe Fibres, in the enlarged State of the *Uterus*, muſt inſtruct us in the Make and Structure of that Cavity, which hitherto was not obſerved; that it has its Fibres diſpoſed in a circular Courſe, having the moſt vertical Part for their common Centre, about which they all turn at a leſs or greater Diſtance, being in Miniature, that very Courſe of Fibres

Ruyſch

Ruyſch has deſcribed as one Muſcle, and repreſented as ſuch in his *Tractatio Anatomica de Muſculo in Fundo Uteri:* Where we may obſerve, that though he has repreſented none of the Fibres as a complete Circle, that yet they are all circular, keeping the Courſe we have defined. In that Tract he ſpeaks, as if Part of the *Placenta* did not anſwer to the Muſcle in ſome Caſes; but he tells us no Inſtance where he found it ſo: Wherefore we muſt look upon this only as a Suppoſition, to anſwer for the Difficulty there is ſometimes in ſeparating the *Placenta*; and it is plain from the Author's Strain of arguing it was no more; which he would never have fallen into, if he had ſeen Things in the Light we have placed them, it being certain, from our Account of Things, that the *Placenta* can never be found ſeparate from this Muſcle, which, as we ſaid, is nothing elſe than what originally was the whole of the Cavity of the *Fundus Uteri*, to which the *Ovum* inevitably fixes. Nor do I ſee that there is Occaſion to change its Name, that has been given it in this enlarged State of the *Uterus*, that of *Ruyſch's Muſcle*; ſince he was the firſt who obſerved its Boundaries and Figure in that State; and ſince it, as he aſſerted, anſwers well the Office of a Muſcle,

in separating the *Placenta*: For the *Placenta* of itself does not contract; and therefore, upon the Contents of the *Uterus* being discharged, and so the overstretched Fibres left at Liberty, these circular ones, attached to the *Placenta*, in contracting, must desert the *Placenta* and leave it loose, which is the Office *Ruysch* allotted to it. And as he has caused this Part to be drawn in the Tract we have mentioned, he has described it as very concave and hollow; and I make no Doubt that these who have Occasion to see the *Uterus* immediately after Delivery, will see this Cavity forming by itself, as has appeared to *Ruysch*. What confirms me in this Notion is, that upon managing an adhering *Placenta*, I have found it included in a very distinct Pouch by itself; which I remember particularly to have happened to me in a Case where there were Twins, and where the second Child was so included in this distinct Cavity, that after the Delivery of the first, when I was searching for the *Placenta*, not suspecting Twins, I felt no more of the second than Part of the Head, though now I was in the Region of the Spleen; and before this Place there was a very large Vacancy between it and the *Os Tincæ*: After I made way for the Child, I had Occasion to bring both *Placenta's*, though

though they were diſtinct, from the ſame Cavity, which was contracting very faſt. If I had not had a particular Notion of the *Fundus* at that Time, I would have been very ready to have ſuſpected an *Uterus* divided in two, or an *Uterus* with Horns. Since that Time I was called to a Woman, who continued in very hard Labour, tho' delivered of her Child, and whoſe Belly, immediately above the *Os Pubis*, was bulky and hard: I could not determine what the Caſe was, till examining with my Hand introduced into the *Uterus*, I felt the Womb hard and inflamed all round its Cavity, and Part of it forced down below the *Os Pubis* into the *Vagina*; which certainly was the Occaſion of the Labour: But ſomewhat to the right Side, above the *Pubis*, I was very ſenſible of a diſtinct Cavity, where two or three Fingers had Difficulty to enter. This I reckoned the *Fundus* taking its proper Form, by means of its circular Fibres; which, according to what we have ſhewed from *Ruyſch*, are to be diſtinguiſhed from the other Parts of the *Uterus* in its enlarged State. From which Hiſtory I would perſwade my ſelf, that the Deſign of parting the *Uterus* into an upper and under Cavity is manifeſt, the firſt being deſigned for the convenient Ingraftment

of the *Placenta* into one certain Place of the *Uterus*, and the other for the receiving and giving Place to the membranous Part of the Secundines: By which Contrivance we ſee, that the *Muſculus Ruyſchii* and *Placenta* muſt always be together, and that the membranous Part of the Secundines muſt always be contiguous to the *Os Tincæ*. And ſince the conſidering the two diſtinct Cavities of the *Uterus* has given Occaſion to theſe Reflections, we ſee how lucky it was to have had them diſtinguiſhed by different Names. It is this which has made Authors ſo pointedly examine into their different Structure and Uſe: And it is this that conducted us in our Speculations. And after I have carried them the Length I have here narrated, in which, I hope, I have adduced ſufficient Authority, I would venture to make one Suppoſition, relating to the globular ſmall Bodies ſcattered through the whole Bounds of the *Cervix*, amongſt the many that have been made concerning them; and that is, That they ſeparate a mucous Humour, to keep ſeparated the membranous Part of the Secundines and the contiguous *Cervix*: For, by our Doctrine, the whole membranous Part of the Secundines lies contiguous to the *Cervix*. It was moſt convenient then, that they ſhould be kept

from

from uniting; and Nature, for this End, in other Places, has contrived ſuch a Set of ſmall glandular Bodies; ſo that it is natural to ſuppoſe they may be employed the ſame Way here: For in Pregnancy, by our Suppoſition, the inner Surface of the *Cervix* is ſo dilated, as to be of equal Extent with the membranous Part of the Secundines; and of Conſequence, the glandular Bodies will be proportionally ſcattered through that Space; and in their moſt enlarged State, come to ſupply that great Quantity of mucous Humours that flow from Women near the Time of the Birth: Which muſt certainly flow from the whole Bounds between the membranous Part of the Secundines and contiguous Part of the *Uterus*, and ſo lubricate much the *Os Tincæ*, as *Sanctorinus* would have them. Whoſe Account of this Part, both as to the Largeneſs of the *Cervix* toward the Birth, and the Diſpoſal of theſe glandular Bodies, anſwering much our Hypotheſis, I ſhall ſet down here, for the Satisfaction of my Readers, *Obſerv. Anat. cap.* 11. § 9. *Ad puerperarum autem repetitas diſſectiones quod attinet, incredibili pene numero mucoſas eas veſiculas per ampliſſimam tum temporis Uterinæ cervicis cavitatem diſjectas comperi; ut vel harum numerum pregnationis tem-*

tempore augeri, vel quod majus consonum est, earundam vix visibilia corpuscula, usque adeo adolescere dicendum, quo exstillante humore tum sensim earum membranarum relaxentur fibræ, tum præter aliud fortasse quodpiam pregnationis commodum facilius illac pertranseunti fœtui via sternatur.

And thus, Sir, I have laid before you the Facts which I think conduce most for forming a right Judgment of these two Cavities, into which we find the Body of the *Uterus* naturally divided; and I am apt to persuade my self, that thereby I have somewhat contributed to the clearing the History of that obscure, tho' efficacious *Viscus*. It is but very lately since we came to have any Notion in what Manner its Appendices, the *Ovarium* and *Tubes*, were employed: But the Observations which put it out of Doubt, that the Conception is sometimes found in the *Ovarium* and *Tubes*, and the Experiments made upon Brutes, have cleared and demonstrated each of their Offices beyond Contradiction. *Morgagni* had of late given us a beautiful Scheme of the *Fundus Uteri* from the Life, whereby we could not but be satisfied with the Uniformity of that Cavity, and what immediate Access there was from it to the Mass of Blood; and

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demonſtrated further, that the *Placenta* was certainly contiguous to the Blood in Pregnancy. *Ruyſch*, about the ſame Time, took notice, that where the *Placenta* fixed, there was a Muſcle ſome-how proportioned to it. What I pretend to determine is, that all this uniform Cavity has the *Placenta* attached to it; and that it was moſt certainly calculated for its Service: This the Figure of early *Placenta's* demonſtrates; this the Combination of *Placenta's*, when there is a Plurality of Children; this the Variation of the umbilical Cord; this comparative Anatomy makes appear, with that Conſiſtency and Simplicity wherewith Truth is always accompanied. And can we imagine, ſince the *Placenta* was to have a Muſcle ſurrounding it, that a more certain Method could have been fallen upon to adjuſt their relative Poſition? Or that a ſecurer Method could have been contrived, for the ſteady Ingraftment of the *Ovum* and *Uterus*? And for determining that the membranous Part of the Secundines ſhould always be adjacent to the *Os Tincæ*? And I hope that the whole of the Hiſtory will be the more acceptable to the Anatomiſt, that it gives us a rational Account of *Mola's*, which hitherto had ſo much obſcured the Hiſtory of the *Uterus*.

XIV. *An*

XIV. *An Essay concerning the Motions of our Eyes; by* WILLIAM PORTERFIELD, M. D. *Fellow of the College of Physicians at* Edinburgh.

PART II.

Of their internal Motions.

HAVING, in the former Part of this Essay, treated of the *external Motions* of our Eyes, I shall now, without much Preface or Introduction, enquire into the *internal Motions* of these most beautiful and useful Organs.

This is indeed a very curious and entertaining Subject; but it is very difficult and extensive: It takes in not only those Motions, whereby our Eyes are fitted for seeing distinctly at different Distances; but it also takes in the Motions of the *Uvea*, serving to dilate and contract the Pupil: To each of which belongs a good deal of subtile Anatomy, both human and comparative; and both

both together comprehend almoſt an entire Syſtem of Opticks; not a mathematical Syſtem, but, which is more, a phyſical one, which includes and ſuppoſes all that is mathematical in this Science.

It is not therefore to be expected that I ſhould here attempt at exhauſting this Subject. This is a Work that is not to be executed in the narrow Bounds of ſuch a Paper as this. And to write a Volume, or even any methodical finiſhed Treatiſe, is neither my preſent Buſineſs nor Inclination. All I propoſe is an Eſſay fit for theſe Collections: In which my chief Purpoſe ſhall be, to fix and eſtabliſh ſuch of the fundamental Principles appertaining to this Subject, as may be of moſt general Uſe, for explaining the Phænomena of Viſion, and for tracing up morbid Symptoms to their firſt Cauſes; without which there is no Foundation on which a ſure and rational Practice can be built. As for other Things of leſs general Uſe, and that have but little Influence on Practice, they are no part of my preſent Deſign; and therefore ſhall not be meddled with, but by the By, and when they may ſerve for illuſtrating and confirming the Doctrine I embrace.

Now the *internal Motions* of our Eyes are either ſuch as reſpect the Change of Con-

Conformation, that is necessary for seeing distinctly at different Distances, or such as only respect the Dilatation and Contraction of the *Pupil*.

That our Eyes change their Conformation, and accommodate themselves to the various Distances of Objects, will be evident to every body, who but reflects on the Manner and most obvious Phænomena of Vision. It is now well known, and it has been demonstrated, beyond all Exception, that when a Man views any Object, the Light which comes from its several Points is so refracted by the transparent Skins and Humours of the Eye, as to converge and meet again, at so many Points, in the Bottom of the Eye, and there to paint the Picture of the Object upon the *Retina*, with which the Bottom of our Eye is covered; which Picture being propagated by Motion, along the Fibres of the optick Nerves, into the Brain, is the Cause of Vision; for accordingly as these Pictures are perfect or imperfect, the Object is seen perfectly or imperfectly.

Thus in general Vision is performed; and to be convinced thereof, we need only take off, from the Bottom of the Eye, a small Bit of the *Sclerotis* and *Choroides*, and having, instead of them, applied the Membrane

brane of an Egg, or a Bit of oiled Paper, that the Humours may not escape; place this Eye at a Hole in the Window-shut of a dark Chamber, so as the Bottom of the Eye may be towards you; for you shall then see, through the Membrane or oiled Paper, the Pictures of external Objects lively painted on the *Retina*, with their proper Figures and Colours; only these Pictures will be inverted, just as it happens in the vulgar Experiment of the *Camera obscura*, where the Images of external Objects are received upon a Sheet of white Paper, placed at a due Distance behind the *Lens*. But it must still be remembred, that, according as these Pictures of external Objects formed on the *Retina* are more or less perfect and exact, the Object itself will be seen more or less perfectly and distinctly: For when the Rays that come from any Point of the Object are not exactly united upon the *Retina*, the Picture of this Point will not be a Point, but a Spot; which being confounded with the Pictures of the neighbouring Points, must render Vision very confused and imperfect. We have an Example of this in the Eyes of *old Men*, whose Humours are so much wasted and decayed, that, through a Penury thereof, the *Cornea* shrinks and becomes less convex, and the *Crystalline* grows

grows flatter than before; by which means the Light is not sufficiently refracted, and, for want of sufficient Refraction, does not converge to the Bottom of the Eye, but to some Place beyond it; and, by Consequence, paints in the Bottom of the Eye a confused Picture, and, according to the greater or lesser Confusion of this Picture, in the more or less flat Eyes, the Object itself appears more or less confused and indistinct. This is the Reason of the Decay of Sight in *old Men*, and shews why their Sight is mended by Spectacles; and the contrary happens in *short-sighted Men*, whose Eyes are too convex and plump: For the Refraction being now too great, the Rays which come from the several Points of the Object will be made to converge, so as to convene, in so many distinct Points, within the Eye, before they come at the *Retina*; and therefore will, after crossing one another, where they meet within the Eye, again diverge, so as the Picture made in the *Retina*, by these diverging Rays, and the Vision caused thereby, will not be distinct, unless the Object be brought so near the Eye, as that the Place, where the converging Rays convene, may be removed to the *Retina*, or that the Plumpness of the Eye be taken off, and the Refractions

ons diminiſhed, by a concave Glaſs, of a due Degree of Concavity; or, laſtly, that by Age the Eye grow flatter, till it come to a due Figure: For *ſhort-ſighted Men* ſee remote Objects beſt in old Age; and therefore they are accounted to have the moſt laſting Eyes.

But though it is certain that all Objects are ſeen perfectly or imperfectly, according as their Image on the *Retina* is perfect or imperfect; yet we are not from this to imagine, that the Eye, or rather the Mind, by means thereof, does ever ſee any ſuch Image on the *Retina*; or that it judges of the Object from what it obſerves in this Image. This is a vulgar Error, which, on Reflection, every one's Experience muſt ſoon convince him of; and it cannot be denied but every body is himſelf beſt Judge of what he ſees. This I have taken notice of in the former Part of this Eſſay; where I have alſo demonſtrated, that all the Perceptions of the Mind are preſent with it, and in the *Senſorium*; and that, in ſeeing Objects, the Mind, by means of an *original* and *connate Law*, traces back its own Perceptions, from the *Senſorium* to the *Retina*, and, from thence, along right Lines drawn perpendicularly to the *Retina*, from that Point of it, where the Impreſſion is made by the

Image, to the Object itself; whence it is, that the Mind, or visive Faculty, does always see every Point of the Object without the Eye in these perpendicular Lines: From which it is easy to understand, how the Object appears perfect or imperfect, according as its Image on the *Retina* is perfect or imperfect, without having Recourse to the groundless Supposition, of the Mind's seeing a Picture in the *Retina*; for when the Rays that come from the several Points of the Object are not exactly united upon the *Retina*, the Picture of each Point being a Spot that takes up a considerable Space upon the *Retina*, and that is confounded with the Pictures of the neighbouring Points, which also are Spots, it must make these Points to be seen in a great many Places, and a great many Points to be seen in the same Place: From which Confusion the Appearance of the Object will be confused and indistinct. Thus (in *Tab.* II. *Fig.* 1.) let COB be an Object, whose Points O, B and C, by emitting Rays that are not reunited at the *Retina*, but beyond it as far as X, do upon the *Retina* form the circular Images *o*, *b* and *c*; and let F be the Centre of the Eye, through which every Line that is drawn perpendicular to the *Retina* must pass. From the extreme Points of

these

these circular Images on the *Retina*, *o*, *b* and *c*, draw right Lines to the Point F, and continue them to the *Horopter*, as in the Figure; these Lines, by reason they pass through the Centre of the Eye F, will be perpendicular to the *Retina*: Whence it is evident, that the Points O, B and C must be seen without the Eye, in the whole of the circular Spaces OCIB, BOLH and CGKO, which are comprehended within the straight Lines drawn perpendicularly to the *Retina*, from the extreme Points of the Images of the respective Points; which Circles being confounded with one another, it follows, that the Points O, B and C must, for the Reason above observed, appear confused and indistinct, though the Eye sees not the Confusion that is in their Images at the *Retina*.

From what has been now said concerning the Manner of Vision, it follows, that, in order to see Objects at different Distances distinctly, it is necessary that there should be a Change in the Eye, lest the Place, in which the Picture of the Object is exact, should fall short of, or beyond the *Retina*, and so cause the Vision to be confused: For Instance, if just now my Eye is of such a Conformation, as that, when I look upon an Object at a Foot distance, I see it per-

fectly and diſtinctly, by reaſon, that the Rays, which, in coming from the ſeveral Points of the Object, fall upon my Eye, are ſo refracted by the Humours thereof, as to converge and meet again in ſo many diſtinct Points at the *Retina*; if this ſame Object be removed to five or ſix Foot diſtance, and the Eye, at the ſame Time, retain unalterably its former Conformation, it muſt appear confuſed and indiſtinct; becauſe the Rays, which come from the Object at this Diſtance, are leſs diverging, than when it was at a Foot diſtance; and conſequently will, in paſſing the *Humours* of the Eye, be made to convene before they reach the *Retina*, and ſo paint thereon a confuſed Image of the Object: Whence it ſeems evident, that, in order to ſee Objects equally diſtinct, at one Foot's diſtance, and ſix Foot diſtance, it is neceſſary that the Eye change its Conformation; either, by having its Humours made more or leſs flat, or, having the Diſtance betwixt the *Cryſtalline* and the *Retina* increaſed or diminiſhed. And this does likewiſe further appear, by the Analogy of the Images painted on the *Retina*, and thoſe painted on a Sheet of white Paper, by means of a *Lens* placed at a Hole in the Window-ſhut of a dark Chamber; for if the *Lens* be of ſuch

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a Convexity, as is neceſſary to paint the Image of a Body, at a Foot diſtance from it, diſtinctly upon a Sheet of white Paper, five or ſix Inches behind the *Lens*, the ſame Object, removed to the Diſtance of ſix Feet from the Window, will not be painted exactly upon the Paper, unleſs, in place of the former *Lens*, you ſubſtitute one leſs convex, or diminiſh the Diſtance betwixt the *Lens* and Paper, by bringing the Paper nearer the Window.

And here it may not be improper to obſerve how careful Nature has been to form the Eyes of all Animals, ſo as, upon all Occaſions, to ſee Objects diſtinctly at an ordinary Diſtance. Every body knows that the *Cornea* is always protuberant, and more convex than the reſt of the Globe; but in all Animals this Protuberancy is not always the ſame: In Man, and the greateſt part of Quadrupeds, the *Cornea* is a part of a Sphere, whoſe Diameter is an Eighth-part leſs than that of the *Sclerotica*; but Birds have their *Cornea* much more elevated and convex, being part of a Sphere, whoſe Diameter is only the half of the Diameter of the *Sclerotis*. Now, the Uſe of the *Cornea*, with the aqueous Humour which lies behind it, being to begin the Refraction of the Rays of Light, which is afterwards per-

fected in the *crystalline* and *vitrous Humours*, so that all that procede from the several Points of the Object are again united in so many corresponding Points on the *Retina*, it may be asked how it comes to pass, that this great Convexity of the *Cornea* in Birds does not render their Sight confused and indistinct, by increasing the Refraction, and making the Rays meet at some Point before the *Retina*, as always happens to *short-sighted Men*, who never see Objects distinctly at an ordinary Distance, by reason, their too plump and convex *Cornea* makes the Rays convene too soon behind the *Crystalline*. To this we answer, That this great Convexity in the *Cornea* of Birds is so far from rendring their Sight confused, that it is absolutely necessary for distinct Vision; for it is to be observed, that as in Man and Quadrupeds, the Figure of their Eye is almost spherical; in *Birds*, as well as *Fishes*, it is flat and depressed, both in its fore and back Parts; by which means the *Retina* is placed near the *crystalline Humour*: And therefore, were not the *Cornea* of a Convexness, answerable to the Flatness of their Eyes, and Distance of the *Retina*, the distinct Image of the visible Object would fall behind it, and thereby the Sight would be rendred confused and imperfect,

fect, like that of old Men, who cannot ſee Objects diſtinctly, eſpecially at a ſmall Diſtance, by reaſon their Eyes have become too flat, in proportion to the Diſtance of the *Retina:* And therefore provident Nature, who was never found to neglect any Thing for perfecting the Organs of Animals, has very wiſely increaſed the Convexity of the *Cornea* in ſuch Creatures as have their *Retina* brought near to the *Cryſtalline*, by the Flatneſs of their Eyes; for being thereby enabled to ſee Objects diſtinctly at an ordinary Diſtance, they can, by changing the Conformation of their Eyes, adapt them to all other Diſtances neceſſary.

To the ſame purpoſe alſo belongs the different Figures that have been obſerved in the *Cryſtallines* of different Animals. In Men, Quadrupeds, and the greateſt part of the Bird-kind, it is always *lenticular*; but in ſuch as always reſide in Water, as do the greateſt part of Fiſhes, its Figure is that of a Sphere or Globe; and in thoſe Creatures that are ſometimes upon Land, and other times in Water, as the *Sea-Calf*, the *Cryſtalline* has a middle Figure betwixt that of a *Lens* and *Globe*.

Theſe are the Differences which have been found in the Figures of the *Cryſtalline*, all which are the very beſt that could

have been, for perfecting the Sight of theſe Animals, and are exactly fitted to their ſeveral Circumſtances and Occaſions: For with reſpect to Man and ſuch Animals as live conſtantly in Air, it is not doubted that they are of ſuch a Degree of Convexity as qualifies them for ſeeing diſtinctly at an ordinary Diſtance, and this is what all of us conſtantly experience; but then it may be enquired, how it comes to paſs that ſince, in Land-Animals, the lenticular *Cryſtalline* is ſufficient to refract the Light as much as is neceſſary for Viſion; the ſpherical *Cryſtalline* of Fiſhes does not, by its greater refractive Power, convene the Rays, before they come at the *Retina*, and thereby render their Sight confus'd and indiſtinct, excepting only when the Object is very nigh. To this I anſwer, 1*mo*, That the Eyes of Fiſhes are flat, both behind and before, by which means the *Retina* is not ſo far removed from the *Cryſtalline*, as in Man and Quadrupeds, whoſe Eyes are nearly a perfect Sphere; and therefore that the Rays might be made to meet at a Point on their leſs diſtant *Retina*, it was neceſſary the Refraction ſhould be increaſed by the ſpherical Figure of the *Cryſtalline*. But this is not all; for their ſpherical *Cryſtalline* would be more than ſufficient for the

Diſtance

Diſtance betwixt it and the *Retina*, were it not that the Rays of Light ſuffer no Refraction in their *Cornea* and aqueous Humour. Every body knows that the Light is never refracted, but when it falls obliquely on a Surface which intercedes *Mediums* of different Denſities, and therefore it can ſuffer no Refraction in falling upon their *Cornea* and *aqueous Humour*, becauſe they are of equal Denſity with the Water in which they ſwim; to compenſate which, it was abſolutely neceſſary that their *Cryſtalline* ſhould have a ſpherical Figure for increaſing its Refaction, that the Rays might be brought together to a Point in the *Retina*: But in Land-animals, their lenticular *Cryſtalline* is ſufficient for that End; becauſe the Rays of Light which paſs from the Object, through the rare *medium* Air, ſuffer a Refraction in falling upon their convex and more denſe *Cornea*, and therefore need not afterwards ſo much Refraction in the *Cryſtalline*; and this is the Reaſon of that Difference that is found in the Figure of the *Cryſtalline* in the Inhabitants of Air and Water. From which it is eaſy to ſee, why this Humour is of a middle Figure, betwixt that of a *Lens* and a *Globe*, in the *Sea-calf*, *Cormorant*, &c. For it being neceſſary that theſe and ſuch like Animals

as

as duck in pursuit of their Prey under Water, should see both when in Water and upon Land. This could be no better effectuated, than by giving the *Crystalline* that middle Figure, which, as is evident, must refract the Rays too much when upon Land, and too little when in Water; but by the Change that is made in the Conformation of the Eye, they are enabled to see distinctly enough in both. Hence it is that the *Cormorant*, that large voracious Bird, about the Bigness of a large Capon, does pursue its Prey under Water with such Nimbleness and Agility, and for a long time together, till at last it catch it, which it doth with a Dexterity which is very surprising: And therefore having first put an Iron Ring at the Bottom of its Neck, to the end that the Fish being received into the *Oesophagus*, which is very large, making a kind of Craw, may not enter into the *Ventricle*, it is frequently employed for fishing, and is said to afford a very agreeable Diversion; and what adds thereto is, that after it has seized a Fish, it always throws it up into the Air, and catches it again by the Head as it falls down, that it may swallow it entire, and without Loss of Time: But because of the Ring about its Neck, the Fish gets no further than its Gullet, which being

being large and yielding, ſtretches into a large Pouch or Bag, in which the Fiſh are kept, till it be full; when they force it to come to the Land, and throw them up entire.

From theſe and ſuch like Arguments taken from the manner of Viſion, moſt Phyſicians, as well as Philoſophers, have been brought to believe, that we have a Faculty of changing the Conformation of our Eyes, in order to ſee Objects diſtinctly at different Diſtances; yet the famous *French* Academiſt *Mr. de la Hire* is of a contrary Opinion, and contends, that at whatever Diſtance Objects be placed, yet the Eyes never alter their Conformation; and this he endeavours to demonſtrate from ſeveral Reaſons, and particularly from the following Experiment, which is truly very ingenious and beautiful.

Take a Card, and pierce it with a Pin in two, three or more Places, ſo as the moſt diſtant Holes be not further from one another than the wideneſs of the *Papil:* This done, ſhut one of your Eyes, and apply the Card cloſe to the other, ſo as to view a ſmall Object through its Holes; you ſhall be ſurpriſed to ſee this Object multiplied as many times as there are Holes in the Card, providing it be plac'd out of that preciſe Place, where it would be moſt diſtinctly

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ſeen by the naked Eye; *e. g.* If I ſee an Object diſtinctly when at a Foot diſtance, it will appear ſingle at that diſtance when view'd through the perforated Card; but if it be removed to four, five or ſix Foot diſtance, it will always appear multiplied as often as there are Holes in the Card. In like manner, if the Conformation of the Eye be ſuch as it cannot ſee Objects diſtinctly but at four Foot diſtance, it will at that diſtance appear ſingle through the Card, but at all leſſer Diſtances it will be be multiplied.

This Experiment I have taken notice of in the former Part of this Eſſay, where I have obſerved, that to make it with Exactneſs, you muſt for an Object look to a ſmall luminous Point in a dark Place, ſuch as a little Hole in a Card plac'd before a Candle, or elſe you muſt look at a ſmall black Object placed before a white Surface.

Now it is certain, that if the Rays of Light that come from each Point of the Object are exactly united in a correſponding Point of the *Retina*, the Object will always appear ſingle, though it be viewed through ſeveral ſmall Holes, for the little luminous Cones, OHH, O*hh* (*Fig.* 2.) which have for their Apex or Top a Point of the Object, O, and for their Baſis the little Holes in

in the Card, HH, *hh*, will alſo have all their oppoſite Tops *o o*, in one and the ſame Point *o*, of the *Retina*, RR, which muſt needs make the Object appear ſingle: But if the Eye have not that Conformation, which is neceſſary to reunite theſe Rays in a Point in the *Retina*, each of theſe little Cones will be cut by the *Retina*, either before or after their Reunion; and therefore each Point of the Object ſhall, by its Rays, touch the *Retina* in as many diſtinct Places as there are Holes in the Card, and conſequently the Object will appear multiplied, according to the Number of Holes. Thus if the Rays convene before the *Retina*, let AB be the *Retina*, 'tis evident from the Figure, that this muſt receive the luminous Pencils at two diſtinct Places *x* and *x*. And if the Rays convene behind the *Retina*, let CD be the *Retina*, which alſo muſt receive the luminous Cones at the diſtinct Places *c* and *c*. In both which Caſes the Object muſt appear double, by reaſon that its Picture falls on two diſtinct Places of the *Retina*: Whence it is eaſy to ſee, that if the Card be pierced in three or more Holes, ſo as the moſt diſtant Holes may not be further from one another than the Diameter of the Pupil; the luminous Pencils, and the Places in the *Retina* where theſe Pencils do fall, muſt be

be multiplied according to the Number of Holes; from which Multiplication, the Object it self must also be equally multiplied. From all which the above named Author concludes, that the Conformation of our Eyes is never changed, at whatever distance Objects be placed. For suppose that I see an Object distinctly at a Foot distance, and at the same distance it appears single, when view'd through the perforated Card; if to see the same Object at four Foot distance, it were requisite that the Eye changed its Conformation; then he concludes it would do so, when the Object is view'd at that distance through the Card, which does not happen, as is evident from its being multiplied.

This is the great Argument whereby *M. de la Hire*, both in the *Journal des Sçavans*, *Ann.* 1685, and in his Dissertation *sur les differens accidens de la vüe* published in the Year 1693, endeavours to prove that the *Crystalline* does not change its Figure or Situation, and in general that the Eye receives no new Figure or Conformation, in viewing Objects at different distances. And to do Justice to the learned Author, it must indeed be acknowledged, that at first View, the Argument seems to go a great way towards a full Demonstration of

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what he alledges; nor, so far as I know, has any thing been yet offered by any Author, whether Physician, Anatomist or Optician that can in the least weaken or disprove it; and yet all of them, excepting *Maitre Jean* and some few others, continue to teach, that our Eyes change their Conformation according to the distance of Objects, without so much as once taking notice of *De la Hire*'s Reasoning, or attempting at an Answer; which must appear very strange to every body that considers the Character of the Author, the Strength of his Reasoning, and how long ago it is that his Opinion has been published to the World.

In answer to this Argument of *De la Hire*, I once suspected that when an Object is view'd through a perforated Card, the Eye, by endeavouring to see the Card, adapted itself to as near a Distance as it could, and by continuing in that State, occasioned the Object to appear multiplied, when at a greater or lesser Distance than that to which the Eye is then accommodated: But by some Experiments to be mentioned below, it soon appeared that the Eye did not endeavour to see the Card, nor by any such Endeavour was it accommodated to the nearest Distance possible; and therefore some-

something else must be sought for, in order to reconcile this Multiplication of the Object with our having a Power of accommodating our Eyes to its Distance.

But for the better understanding this Matter, it may be proper, before I go further, to clear up the State of the Question, by admonishing the Reader, that it is not here meant to enquire, why a small Object is thus multiplied, when plac'd without the Limits of distinct Vision; it being evident, that it ought then to appear multiplied, by reason that the Eye can never adapt itself to its Distance. Thus if I cannot see distinctly any Object that is nearer than half a Foot, it must appear multiplied at four Inches; and if I cannot see an Object distinctly that is further off than two Foot, it must appear multiplied at three Foot, and all greater Distances. But my Meaning is to account for this Multiplication, when the Object is plac'd within the Limits of *distinct Vision*, which we have here supposed to be at a Foot and a half distance from each other: And after various Conjectures on the Matter, I am now at last fully satisfied, that there are two Causes that concur in producing this Phænomenon, by hindring the Eye to accommodate it self to the Distance of Objects viewed through the perforated

forated Card, *viz.* the diſtinct Appearance of the Object, and the Miſtake that the Mind commits with reſpect to its Diſtance.

That the Object appears diſtinct, when viewed through a perforated Card, is evident from Reaſon as well as from Experience; for the little luminous Cones OHH Obh, (ſee *Fig.* 2.) which have for their *Apex* or Top a Point in the Object O, and for their *Baſis* the little Holes in the Card HH, *hh*, will, by reaſon of their Acuteneſs, proceeding from the Smalneſs of the Holes, take up but a very little Space upon the *Retina*, whence the Object muſt appear pretty diſtinct. Thus if the Object is at too great a Diſtance, let *o* be the Place where the Rays convene, and let AB be the *Retina*; it is plain that the luminous Pencils will fall on the *Retina* at *x* and *x*, where, for the Reaſon juſt now mentioned, they muſt take up but a very little Space, and conſequently the Confuſion muſt be very ſmall. In like manner, if the Object is too near, let CD be the *Retina*, and *o* the focal Point where the Rays are united, theſe Pencils will, at *c* and *c*, occupy ſo ſmall a Space on the *Retina*, as to occaſion no ſenſible Confuſion in the Object; whereas, in both Caſes, had it not been for the Interpoſition of the Card, the luminous Cone *mom*, would,

on the *Retina*, have taken up the whole Space *xx* or *cc*, which must have rendred the Appearance of the Object very confused and indistinct. To correct which Confusion, the Eye changes its Conformation, and adapts itself to the distance of Objects seen with the naked Eye. But when by means of the perforated Card this Confusion is taken off, the Mind will not then change the Conformation of our Eyes, there being nothing that should influence it to such an Action. And this is one Reason why the Object is so frequently found multiplied, according to the Number of Holes through which it is viewed, though it be placed within the Limits of *distinct Vision*, to which the Eye can perfectly accommodate it self.

But there is yet another Cause which must concur towards this Multiplication, and that is, the Mistake into which the Mind falls, with respect to the Distance of the Object. It is not enough that the Mind perceives no Confusion: For though this Confusion in our Sight is commonly believed to be the only thing that can influence our Mind to change the Conformation of our Eyes; yet by reason of that necessary Connexion and Dependence, that will be hereafter shown to have been established by

Habit

Habit and Cuſtom betwixt thoſe Motions, whereby the Conformation of our Eyes is changed, and certain correſponding Motions of the *Axes of Viſion*; theſe Motions come at laſt always to accompany one another, and that ſo neceſſarily as to make it impoſſible for us, by any Act of Volition, to direct our Eyes to any Object within the Limits of *diſtinct Viſion*, without, at the ſame time, giving them that Diſpoſition that is neceſſary for ſeeing diſtinctly at that Diſtance; and therefore though there ſhould be no Confuſion in the Object, when ſeen through the perforated Card, it would not then appear multiplied, if placed within the Limits of diſtinct Viſion, did not the Mind miſtake its Diſtance: For when the Mind judges rightly of the Diſtance of any Object, both Eyes are neceſſarily directed towards it, and that as well when one of them is ſhut, as when both are open; from which Direction of our Eyes, they muſt alſo be accommodated to its true Diſtance: Whence the Object will not appear multiplied, and therefore there muſt be another Cauſe, beſides the diſtinct Appearance of the Object, that muſt concur in this Multiplication; and that is the Miſtake the Mind commits, with reſpect to its Diſtance.

I know that *M. de la Hire* affirms, that

we judge rightly of the Diſtance of Objects view'd through a perforated Card, and indeed moſt People, upon Trial, will be apt to fall into the ſame Miſtake; but we will afterwards have Occaſion to touch upon all the Means the Mind can poſſibly employ for judging of the Diſtance of Objects; from which it will appear, that in the Caſe before us, we can ſcarce form any Judgment with reſpect to Diſtance, but what is wholly founded upon Prejudice and Anticipation, which cannot fail of betraying us into Error and Miſtake. Seeing then that we are ſo liable to be miſtaken in the Judgment we form of the Diſtance of Objects ſeen through a perforated Card, it needs be no Surprize that the Eye ſhould not be accommodated to their true Diſtance; and that, for want of this Accommodation, they ſhould appear multiplied according to the Number of Holes through which they are viewed.

Thus I have fully anſwered the Argument wherein *de la Hire* places his main Strength, and have ſhown that the Eye may be poſſeſſed of a Power of changing its Conformation, and of adapting itſelf to the Diſtance of Objects, though this Power ſhould not be exerted when the Object is viewed through a perforated Card. But then our

Author

Author alledges, that from an anatomical Examination of all the Parts belonging to our Eyes, it will be found that none of them are capable of making any of thoſe Changes in the Eye, that are ſuppoſed neceſſary for ſeeing diſtinctly at different Diſtances; but this we ſhall conſider afterwards, when we come to enquire into the Cauſes of theſe inward Motions in our Eyes.

There is yet another weighty Argument brought by the learned Author againſt this Change in our Eyes; and that is, that there is no Need of ſuppoſing any ſuch Change; and that the Eye can ſee Objects diſtinctly enough at different Diſtances, ſo as not to be ſenſible of any Defect in the Sight, without being obliged to have Recourſe to any Change in its Conformation.

For underſtanding this, we muſt firſt obſerve, that if an Object appear diſtinct at ſix Foot diſtance, that is, if the Conformation of the Eye be ſuch as is neceſſary to refract the Rays which come from a Point of the Object at that Diſtance, ſo as that, in falling upon the *Retina* after Refraction, they impreſs it with a diſtinct Image of that Point from whence they came, then at whatever greater Diſtance the Object be placed, it will alſo appear diſtinct: The Reaſon of which is, that when the Object

is at six Foot distance, the Rays which, in coming from a Point thereof, fall upon the Pupil, are nearly parallel; and therefore at whatever greater Distance the Object be placed, the Rays may be conceived as parallel, and consequently the same Conformation of the Eye that is necessary to refract them, so as to make the Object appear distinct at six Foot distance, will also refract them in the same way, and thereby make it also appear distinct at all greater Distances.

Now this being understood, let us see how *de la Hire* accounts for distinct Vision at different Distances, without changing the Conformation of the Eye.

Suppose then that a Man's Sight is good, that is, that he sees Objects distinctly enough at a Foot distance, and likewise at six Foot distance; it follows from what has been said, that to see Objects at all greater Distances than six Feet, there is no Need of any Change in the Conformation of the Eye: So that the only Question is, How the Object can appear distinct, both at the distance of six Feet, and of one Foot, without suffering any Change in its Conformation?

To this the above named Author answers, That to see Objects so distinctly, as not to be sensible of any Defect in the Sight, it is

not

not needful that the Rays, which come from a Point in the Object, ſhould be united accurately in a Point in the *Retina*, but that it is ſufficient they ſhould be nearly ſo: Whence he concludes, that if the Conformation of the Eye be ſuch, as when an Object view'd through two Holes in a Card at two Foot diſtance appears ſingle, becauſe all the Rays that come from the ſeveral Points of the Object, are united accurately in ſo many Points in the *Retina*; then, at one Foot diſtance, the Place where the Rays meet will be a little behind the *Retina*, and at ſix Foot diſtance it will be a little before it, though not ſo much in either Caſe as to render the Object undiſtinct; becauſe the Rays which come from the ſeveral Points in the Object, do, in falling upon the *Retina*, meet nearly though not accurately, in ſo many correſponding Points: And therefore he concludes, that thoſe who have their Eyes of a Conformation proper to ſee Objects moſt diſtinctly at two Foot diſtance, will alſo ſee them diſtinctly enough both at one Foot diſtance, and ſix Foot diſtance; and if they ſee diſtinctly at ſix Foot diſtance, then they muſt alſo ſee diſtinctly at all greater Diſtances: And thus he accounts for that perfect Viſion which ſtands in the Middle betwixt ſhort and long

Sight, without any Change in the Eye.

And as for the Sight of *old Men* who cannot ſee diſtinctly at any leſs diſtance than three Feet, he ſuppoſes that their Eyes are of a proper Conformation to ſee Objects at four Foot diſtance moſt diſtinctly; from which he infers, that at three Foot and all greater Diſtances, the Picture of Objects upon the *Retina* will be pretty diſtinct, and conſequently they will be ſeen without any ſenſible Confuſion, though the Eye ſuffers no Change in its Conformation.

In like manner, in thoſe that are *ſhort-ſighted*, and can't ſee Objects diſtinctly at a greater Diſtance than a Foot, he ſuppoſes the Eye to be of a Conformation proper to ſee moſt diſtinctly at half a Foot's diſtance; and thence concludes, that the Picture made on the *Retina*, when the Object is at any Diſtance betwixt four Inches and a Foot, will not be confuſed; and conſequently the Object will be ſeen diſtinctly enough, without any Change in the Eye, unleſs its Diſtance be greater than a Foot, or leſs than four Inches; in which Caſe the Image on the *Retina* will begin to be confuſed, and conſequently the Object it ſelf will alſo appear confuſed and undiſtinct.

This is in few Words the Sum of what *de la Hire* advances, concerning our ſee-

ing.

ing Objects diſtinctly at different Diſtances, without having Recourſe to any Change in our Eyes. And indeed it can't be denied but the Eye has ſome Latitude of ſeeing Objects diſtinctly, without changing its Conformation, though they be a little further from, or nearer to the Eye, than what is neceſſary for collecting the Rays that come from the ſeveral Points of the Object, in ſo many preciſe Points in the *Retina*; and that becauſe, when the Object is not far removed from that Place, at which the Rays coming from the Object meet again at the *Retina*, the Image thereof will be pretty diſtinct, and therefore will not occaſion any ſenſible Confuſion of Sight: But it does not from thence follow, that our Eyes do not change their Conformation, when Objects are much removed from that Place where they appear moſt diſtinctly: For beſides what we have ſaid before, in ſpeaking of the Images of external Objects, caſt upon a Sheet of white Paper, by means of a *Lens* placed at the Hole in the Window-ſhut of a dark Chamber, where we obſerved, that in order to make the Image diſtinct, it was neceſſary, according to the different Diſtance of the Object, either to change the *Lens*, for one more or leſs convex; or to change the Diſtance

stance betwixt it and the Paper, by bringing the Paper nearer to, or further from the *Lens*, according to the different Distances of the external Object; I say, besides this, Experience teaches us, that the Conformation of our Eyes is changed, in viewing Objects at different Distances. For every body knows, that the Eye can't see equally distinctly at the same time Objects at different Distances, *e. g.* if with one of your Eyes, the other being shut, you look attentively to a small Object, suppose a Pin, at half a Foot or a Foot from the Eye, and at the same Time place another at six Foot distance, that at six Foot will appear exceding confused; but if you apply yourself to observe accurately that at six Foot distance, then it will be seen distinctly, but the other next the Eye will appear very confused and imperfect; which plainly shews, that when the Disposition of the Eye is such as is necessary for making a distinct Picture of the Pin at one Distance, the Place where the distinct Picture of the other Pin is made, must fall short of, or beyond the *Retina*; and consequently, upon the *Retina* itself, the Picture must be confused, from which Confusion, Vision is rendred imperfect and undistinct; and therefore, since at Pleasure I can see distinctly

ſtinctly either of the Pins I will, while at the ſame Time the other appears confuſed; it follows, that I have a Power of changing the Conformation of my Eye, and of adapting it to the different Diſtances of Objects; and this is the only Reaſon can be given, why Objects without Doors do not appear diſtinct through a Window-glaſs, when the Eye is attentive in obſerving the little Scratches or Particles of Duſt upon the Surface of the Glaſs; and, on the contrary, when attentive to the external Objects, it does not diſtinctly obſerve the Scratches or opaque Particles of Duſt upon the Glaſs; the Conformation of the Eye in the one Caſe being ſuch as to paint diſtinctly upon the *Retina* the Images of the Scratches and Particles of Duſt, but not to paint thoſe of the external Objects but confuſedly; and in the other Caſe, the Conformation of the Eye is adapted to paint exactly upon the *Retina* the Images of external Objects; and therefore the Place, where the diſtinct Images of the Scratches are made, muſt fall behind the *Retina*, from which they muſt appear confuſed and imperfect: And indeed, were it not for the Change that is made in the Diſpoſition of the Eye, it were very difficult to explain how Birds, that duck in Purſuit of their Prey, ſhould

be enabled to ſee both in Air and Water, ſeeing the Refraction that happens in the Eye is ſo far different in the one Caſe from what it is in the other.

To weaken the Force of theſe Objections, *M. de la Hire* has Recourſe to the Mobility of the *Pupil*, from which he endeavours to account for diſtinct Viſion at all Diſtances, without any Change in the Conformation of the Eye; but with what Succeſs will appear afterwards.

Having thus conſidered what *de la Hire* brings in ſupport of his Hypotheſis, I ſhall now procede to ſome Experiments I made for meaſuring the Strength and Weakneſs of Sight; whereby not only the Fallacy of *de la Hire*'s Reaſoning will be made further manifeſt, but it will alſo be demonſtrated, beyond all Exception, that our Eyes change their Conformation, and adapt themſelves to the various Diſtances of Objects, within certain Limits; which Limits will alſo be accurately determined: But that theſe Experiments may be the better underſtood, I muſt firſt premiſe the following Axioms.

AXIOM I.

When an Object, ſeen with both Eyes, appears double, by reaſon that its Diſtance is leſs than that to which the Eyes are directed,

rected, upon covering either of the Eyes, the Appearance that is on the contrary Side will vaniſh; and if it appear double, becauſe its Diſtance is greater than that to which the Eyes are directed, upon covering either of the Eyes, the Appearance that is on the ſame Side will vaniſh.

Illuſtration. To illuſtrate this, ſee *Fig.* 3, 4 and 5. where A and B are the Eyes, *x* the Object, which is at a ſmaller Diſtance than the Point C, to which both Eyes are directed: It is evident, that while the Eyes continue directed to C, the Object *x* muſt be ſeen in two different Places, which, with reſpect to the *Horopter*, to which all Objects are referred, will be D and E; for being ſeen by the right Eye B, in the Direction of the viſual Line B*x*D, it muſt, at D, hide a Part of the *Horopter* DCE; and being ſeen by the left Eye A, in the Direction of the viſual Line A*x*E, it muſt hide a Part of the *Horopter* at E; and therefore, with reſpect to the *Horopter* on which the Eyes are fixed at C, the Object *x* muſt appear to the right Eye B, as at D, and to the left Eye A as at E; and, in covering either of the Eyes, the Appearance that is on the contrary Side will be made to vaniſh.

In like manner, if the Eyes are directed

to

to *x*, the Object C, which is further off than *x*, will be seen by the right Eye B, in the Direction of the visual Line B*m*C; and by the left Eye A, it will be seen in the Direction of the visual Line A*o*C: And therefore, with respect to the *Horopter mxo*, to which all Objects are referred, it must appear double, as at *m* and *o*; and in covering the right Eye B, the Appearance that is on the right Side towards *m* will vanish; and in covering the left Eye A, the Appearance that is on the left Side towards *o* will vanish; all which is exactly agreeable to Experience.

AXIOM II.

When an Object appears double, from its being seen with one Eye through two small Holes made in a Card, or any other opaque thin Body; if its Distance be greater than that to which the Eye is accommodated, upon covering either of the Holes, the Appearance that is on the same Side will be made to vanish; and if its Distance be less than that to which the Eye is accommodated, upon covering either of the Holes, the Appearance that is on the contrary Side will be made to vanish.

Illustration. Let E be the Eye, (*See Fig.* 6 *and* 7.) QT the Card, in which are two

two ſmall Holes *d* and *r*, and let A be a ſmall Body, at a greater or leſſer Diſtance than that to which the Eye is accommodated: The Rays of Light, A*d*, A*r*, will not, after Refraction, converge to a Point in the *Retina*; but by reaſon that the Diſtance of the Object A is greater or leſs than that to which the Eye is accommodated, they will be made to converge to ſome other Point, either before or behind the *Retina*, ſuch as *o*; but on the *Retina* itſelf they will fall on the different Points *i* and *m*, at both which a Picture of the Object will be formed; from which Duplication of the Picture, the Object itſelf will alſo appear double at C and B, *viz.* in the right Lines *i*C and *m*B, which are ſuppoſed to be drawn perpendicular to the *Retina* from the Points *i* and *m*, where the Pictures fall. Whence it is evident, that if the Hole at *d* be covered, there will be no Image at *i*, and conſequently the Appearance at C will vaniſh; and if the Hole at *r* be covered, there will be no Image at *m*, and conſequently the Appearance at B muſt vaniſh: But when the Object A is at a greater Diſtance than that to which the Eye is accommodated, as in *Fig.* 6. the Appearance that is made to vaniſh, by covering either of the Holes *d* or *r*, lies on the ſame Side with the covered

vered Hole. But when the Object A is at a leſs Diſtance than that to which the Eye is accommodated, as in *Fig.* 7. the Appearance that is made to vaniſh lies on the contrary Side of the Hole that is covered, as has been affirmed in the Axiom.

Exper. 1*ſt.* I took a ſmall Plate of white Iron IK, (*See Fig.* 8.) in which I had cut two parallel narrow Slits, whoſe Diſtance from one another did not excede the Diameter of the Pupil. Theſe Slits gave Paſſage to more Light than what could paſs through ſmall Holes, and therefore were fitter for my Purpoſe, it being neceſſary that the Object ſhould be clearly ſeen. This Plate I held cloſe to my right Eye B, in ſuch manner as the Slits might have a vertical Poſition; and having ſhut my left Eye A, through theſe Slits I viewed the ſmall Object *o*, which alſo had a vertical Poſition, and conſequently was parallel to the Slits. In this Experiment the Object *o* was at ſuch a Diſtance from the Eye B, as to appear ſingle, when viewed in this manner through the Slits: But when both Eyes were opened, and directed to a more diſtant Point, ſuch as P, three Appearances were ſeen, *a*, *b* and *c*; which Appearances were nearer to, or further from each other, according as the Point P was nearer to,

or

or further from the Object o, and in covering the left Eye A, the Appearance *a* that was on the contrary Side did vaniſh, which Appearance did therefore belong to the Eye A. And in covering the right Eye B, the Appearances on the contrary Side *b* and c, belonging to the Eye B, did vaniſh, from which I was certain that the Diſtance of the Object o was leſs than that to which the Eyes were directed, (*See Ax.* 1.) This being done, my next Buſineſs was to examine, whether theſe double Appearances *b* and c, that were ſeen thro' the Slits, did not alſo procede from the Object o its being at a leſs Diſtance than that to which the Eye B was then accommodated, and upon Trial I found it was ſo; for by covering either of the Slits with my Finger, the Appearance on the contrary Side was always made to vaniſh, (*See Ax.* 2.) Having ſatisfied myſelf as to theſe Particulars, I changed the Direction of my Eyes, and turned both inwards towards a nearer Point, ſuch as *x*, by which alſo three Appearances were ſeen, *d*, *e* and F, and theſe Appearances were alſo nearer to, or further from one another, according as the Point *x* was nearer to, or further from the Object o, but they were always in a contrary Order to thoſe that were ſeen,

when my Eyes were directed as above: For the Appearance F, seen by the left Eye A, was on the left Side, and the Appearances *d* and *e*, which were seen through the Slits by the right Eye B, were on the right Side; whence I was certain, that the Distance of the Object o was greater than that to which my Eyes were directed. I then covered one of these Slits with one of my Fingers, and I found that the Appearance that was on the same Side did always vanish; from which, when compared with the second Axiom, it follows that the Object o is then at a greater Distance than that to which the Eye is accommodated.

In making this and all the following Experiments, it was necessary that the Object o should be as conspicuous as possible: What upon Trial I found to answer best, was a narrow Slit made in a dark Lantern, in which a lighted Candle was put, to render it luminous, though sometimes I also made use of a black Line upon white Paper, or a white Line upon black Paper, both which answered very well, in all the Experiments wherein the Distance of the Object did not excede two Feet; but when the Distance was greater, these Lines began to be obscure, and by reason of their Obscurity, the Experiment did not succede so well.

well. It muſt alſo be obſerved here, once for all, that though in the above Experiment, it was eaſy for me to direct my Eyes to a Diſtance that was either greater or leſs than the Diſtance of the Object o, without the Aſſiſtance of any other Object, on which my Eyes might be fix'd; yet in this, as well as in many of the ſubſequent Experiments, I was ſometimes obliged to put an Object in that Place, towards which both Eyes were to be directed; and this was always neceſſary, either when a great Effort was needful to give the Eyes the deſigned Direction; or when, for obſerving the Phænomena more accurately, the Experiment required, that the Eyes ſhould for ſome Time be kept fixed in a certain determined Direction, both which are made much eaſier, by having an Object on which the Eyes may be fix'd. When it was required that my Eyes ſhould be directed, to a very near Diſtance, for the Object o I made uſe of a black or white Line, made on Paper of an oppoſite Colour; and at the Place x, to which my Eyes were to be directed, I held in a horizontal Poſition, and parallel to my Eyes, any ſmall Object zx, ſuch as a bit of the Stem of a Quill, whoſe Extremity x, I look'd at for an Object; but when the Experiment required

that my Eyes should be directed to some Point at a considerable Distance beyond the Object o; for the Object o I made use of the narrow Slit in the Lántern, and at the distant Point P, to which my Eyes were to be directed, I placed another dark Lantern, in which was the horizontal Slit PQ, whose Extremity P, which was seen by the right Eye, in the visual Line B*o*P that passed immediately above the upper End of the Object o, served me as a Point of View, on which I could easily fix both Eyes, while I attended to the Appearance of the Object o.

Now from this Experiment, compared with the preceding Axioms, it clearly follows, 1*mo*, That we are possessed of a Power of changing the Conformation of our Eyes, and of adapting them to various Distances. 2*do*, This Change in our Eyes, whereby they are fitted for seeing distinctly at different Distances, does always follow a similar Motion in the Axes of Vision with which it has been connected by Use and Custom; for when the Eyes were directed to P, the Object o was seen double through the Slits, and by covering one of the Slits, it appeared that the Eye was adapted to too great a Distance; and as the Point P was brought nearer and nearer the Object o, these Appearances

pearances approached nearer and nearer to one another continually, till at laſt, when the Point P became very nigh to o, they coincided in one at o, which ſhews that the Eye was then adapted to its Diſtance. But when the Point P was moved along the Line o*x* from o to *x*, two Appearances of the Object o were again ſeen through the Slits; which Appearances being in a contrary Order from what were ſeen, when the Point P was on the other Side of the Object o, it follows that the Eye was then adapted to too ſmall a Diſtance. And as the Point P, in its Motion from o to *x*, receded further and further from o, theſe Appearances receded further and further from one another continually. From all which it is very evident, that there is a neceſſary Connection and Dependence eſtabliſhed betwixt thoſe Motions, whereby the Conformation of our Eyes is changed, and certain correſponding Motions in the Axes of Viſion, which makes it impoſſible for us to direct our Eyes to any Object, within the Limits of diſtinct Viſion, without at the ſame Time giving them that Diſpoſition that is neceſſary for ſeeing diſtinctly at that Diſtance; but theſe two Corollaries will be ſtill further confirmed by the Experiments that follow.

Exper. 2. The Distance of the Object o (*Fig.* 8.) being five Inches, I viewed it through the Slits, the other Eye A being shut or covered, and it appeared double; and upon covering either of the Slits, the Appearance that was on the contrary Side was made to vanish, and therefore the Distance of the Object was less than that to which the Eye was accommodated; and both Eyes being open, and directed to *x*, whose Distance from the Eye was about three or four Inches, three Appearances were seen, *d*, *e* and F, whereof the Appearances *d* and *e* belonged to the right Eye B, and when with my Finger I covered either of the Slits, the Appearance that was on the contrary Side did vanish; whence it is evident, that I cannot, by any Effort, fit my Eyes to so small a Distance as five Inches.

Exper. 3, 4 and 5. At six, seven and eight Inches distance, when one Eye was shut, the Object o, seen through the Slits, appeared double; and by covering one of the Slits, it was evident that its Distance was less than that to which the Eye was accommodated. And in looking with both Eyes to *x*, whose Distance from the Eye was about half the Distance of the Object o, a double Appearance was seen, one at F belonging to the Eye A, and the other at *x*

belonging

belonging to the Eye B, but this Appearance at *x* was always ſingle, though ſeen through the Slits; whence it follows, that my Eye cannot accommodate itſelf to a Diſtance that is much leſs than ſix, ſeven or eight Inches.

Exper. 6. At the Diſtance of nine Inches, the Object o ſeen through the Slits, the other Eye being ſhut, appeared ſometimes ſingle, but moſtly double; and when it appeared double, it was evident, by covering either of the Slits, that it was too near, with regard to the Diſpoſition of the Eye; and when both Eyes were open, and directed to the Quill *x*, which was at half Diſtance preciſely, three Appearances were ſeen, whereof the Appearances *d* and *e* did belong to the right Eye B, to which the Slits were applied; and in covering one of thoſe Slits, the Object on the ſame Side diſappeared: Whence I was certain that the Object was too far off, and that my Eye can be accommodated to a leſs Diſtance than nine Inches, but not much, as may be learned from the Nearneſs of the Appearances, as well as from the four laſt Experiments.

From the five laſt Experiments laid together, we may ſafely draw the following *Corollary, viz.* The neareſt Limits of diſtinct

ſtinct Viſion, in my Eyes, is at about ſeven Inches diſtance; for by the ſecond Experiment it appears, that my Eyes cannot be fitted to ſo ſmall a Diſtance as five Inches; and by the laſt Experiment it is plain, that they can be accommodated to a leſs Diſtance than nine Inches; and the third, fourth and fifth Experiments make it manifeſt, that at ſix, ſeven and eight Inches diſtance, the Object ſeen through the Slits appears always ſingle, whatever Effort be made to double it, by ſtraining the Eyes to ſee a nearer Object; whence the middle Diſtance, ſeven Inches, ſeems to be nearly the neareſt Limits of my Eye, beyond which it cannot go: And therefore all Objects, that are nearer than ſeven Inches, muſt appear more and more confuſed, according as their Diſtance is leſs and leſs than ſeven Inches.

Exper. 7. In looking to an Object at two Foot diſtance, through the Slits, the other Eye being ſhut, it always appeared double and too far off; and in looking with both Eyes to a more diſtant Object, it was then alſo ſeen double; but in covering either of the Slits, the Appearance on the oppoſite Side did vaniſh; whence it was evident, that the Object was then too nigh, but theſe Appearances were ſo cloſe, that

they

they did almoſt touch one another; which ſhews that my Eyes can ſcarce go further than to accommodate themſelves to the Diſtance of two Feet.

Exper. 8. At two Foot and a half, three Foot, and all greater Diſtances, the Object not only appeared double and too far off, when viewed with one Eye through the Slits; but when both Eyes were open, and directed to a very diſtant Object, the double Appearance that was then ſeen through the Slits, was ſuch, as by covering one of the Slits, made it evident, that even then the Object was alſo too far off; from which it follows, that my Eyes can never, by any Effort, be accommodated to ſo great a Diſtance as two Foot and a half.

Corol. From this and the immediately preceding Experiment, it ſeems probable, that the furtheſt Limits of my Sight reaches to the Diſtance of about twenty ſeven Inches: For by *Exper.* 7. it is plain that I can accommodate my Eye to a Diſtance that is greater than two Feet; and by the laſt Experiment it is manifeſt, that my Eye cannot accommodate itſelf to ſo great a Diſtance as two Feet and a half: Whence it ſeems reaſonable to conclude, that the furtheſt Limits of my Sight lies about the middle Diſtance betwixt both.

Exper.

Exper. 9 and 10. At ten and twelve Inches distance, the Object o, seen with one Eye through the Slits, did, as in the 6th *Exper.* where it was at the Distance of nine Inches, appear sometimes single, but frequently double and too nigh.

Exper. 11 and 12. At the Distance of fifteen and eighteen Inches, one Eye being shut, the Object o, seen through the Slits, appeared some times single, and at other times double; but when it was double, by covering one of the Slits, it was always found to be too far off.

Corol. From the four last, as well as from some of the preceding Experiments, it is manifest, 1*mo*, That the Eye does frequently mistake the Distance of the Object seen through the Slits; for when its Distance lies betwixt the Limits of distinct Vision, to which the Eye can easily accommodate itself, it would never appear double, did not the Mind mistake its Distance. And this is the Reason why, when both Eyes are open, and directed to the Object, it appears single at all Distances within the Limits of distinct Vision, by reason the Eye is then accommodated to its Distance, which is then known to us, by means of the Angle which the optick Axes make at the Object. 2*do*, The Judgment which

which the Mind forms with respect to the Distance of Objects, seen with only one Eye through the Slits, is not always the same, but is fluctuating and inconstant, as may be gathered from the four last Experiments, where the Object some times appeared single, and at other times double; and when it appeared double, the Distance betwixt the Appearances was not constantly the same. 3*tio*, If the Object seen through the Slits, the other Eye being shut, is not much beyond the nearest Limits of distinct Vision, when the Mind mistakes its Distance, it imagines it further off than it really is, as is evident from the 4th, 5th, 6th, 9th and 10th Experiments. But 4*to*, When the Object is not a great deal nearer than the furthest Limits of distinct Vision, when we mistake its Distance, we imagine it nearer than it really is; whence it appears double, because it is too far off with respect to the Conformation of the Eye, as does appear from the 7th, 11th and 12th Experiments.

If it should be here enquired, why the Mind mistakes the Distance of the Object seen through the Slits, the other Eye being shut? To this I answer, that by running over all the Means, the Mind can possibly employ for judging of the Distance of Objects, which

which Means we will have Occasion to touch upon below, it will appear that in the Case before us, we can scarce form any Judgment with respect to Distance, but what is intirely founded upon Prejudice and Anticipation; and therefore it needs be no Wonder that we are frequently led into Error and Mistake, and that the Mind should be so fluctuating and inconstant in the Judgments it forms of Distance.

When I made the foregoing Experiments, I designed to repeat them with more Care and Exactness, and to make some new ones of the same Sort, by means of an Instrument I had contrived for that Purpose; which from its Use in measuring the Limits of distinct Vision, and in determining with great Exactness the Strength and Weakness of Sight, may be called an *Optometer*; But I was then interrupted, and I have not now Time to take those Things into further Consideration.

Having thus sufficiently demonstrated, that our Eyes do change their Conformation, and adapt themselves to the different Distances of Objects, it remains that we examine wherein this Change consists, and by what Mechanism it is introduced, about which Authors are very much divided in their Opinions: The chief of which we shall

ſhall now conſider, and fix upon what we think moſt probable, leaving every body at Liberty to differ from us as he ſees Reaſon.

Some are of Opinion, that the whole Globe changes its Figure, by being lengthned into an oblong Figure when Objects are near, and by becoming flat when they are removed to a greater Diſtance. This indeed very well accounts for the diſtinct Appearance of Objects at different Diſtances; for according as Objects are nearer or further from our Eyes, their Images will be painted at different Diſtances behind the cryſtalline Humour: And therefore, if we have a Power of rendring the Eye flat or oblong, the *Retina* will be brought to that preciſe Place behind the Cryſtalline, where the perfect Image of the Object is made, and conſequently will be ſeen diſtinctly.

Now this Change in the Figure of the Eye is differently explained by Authors. Some maintain, that it is rendred oblong by the joint Contraction of the two oblique Muſcles; and this Opinion Dr. *Keill* likewiſe embraces: His Words are, "The aqueous Humour being the thinneſt and moſt liquid, eaſily changes its Figure, when either the *Ligamentum Ciliare* con-

" contracts, or both the oblique Muſcles " ſqueeze the Middle of the Bulb of the " Eye, to render it oblong when Objects " are too near us." (*See his Anat. Chap.* iv. *Sect.* 4.) But this is by no means probable; for in order that the Eye may be rendred oblong by the Contraction of theſe Muſcles, it is neceſſary to ſuppoſe that they preſs its Sides inward towards its *Axis*; but this they cannot perform, becauſe their Diſpoſition is not proper for that Effect: Had they been ſo diſpoſed, as to embrace the Globe in the Form of a Ring, their Contraction might then have ſqueezed the Eye into an oblong Figure; but their preſent Diſpoſition is very far different from what ſeems neceſſary for producing this Change in the Eye; which we ſhall not now repeat, having in the former Part of this Eſſay deſcribed them at ſome length. But beſides this, there is yet another Argument againſt the Eye's changing its Conformation, when theſe Muſcles contract; and that is, that in ſeveral Creatures their Diſpoſition is very far different from what it is in Man: Thus in the *Pike*, they are both ſituated in the under Side of the Eye; where they decuſſate one another in Form of a Croſs, as has been obſerved from *Aquapendente* and *Perrault*, in the former

Part

Part of this Eſſay. In the *Canis Carcharias*, and in ſome other Fiſhes of the Dog Kind, *Steno* has obſerved, that the *Superior oblique* had no *Trochlea*, but that its Origin and Progreſs was altogether ſimilar to the *Inferior oblique*, (*See his Canis Carchariæ diſſectum Caput*, and his *Diſſectio Piſcis ex canum genere.*) And *Peierus* the Son, in his *Obſervationes Anatomicæ*, tells us, that the *Grand oblique* is alſo without any *Trochlea*, both in *Geeſe* and Hares; whence it ſeems very improbable, that theſe Muſcles, ſo differently diſpoſed in different Animals, do ever ſqueeze the Eye, ſo as to render it oblong; and yet it muſt be allowed, that they have a Power of accommodating their Eyes to the different Diſtances of Objects, as well as other Creatures, which therefore muſt be ſought for ſome where elſe, than in the *oblique Muſcles*.

Another Opinion concerning this Change of our Eyes is, that the four *Streight Muſcles*, acting together, compreſs the Sides of the Globe, and by this Compreſſion, reduce it to an oblong Figure, when Objects are near; and that by its natural Elaſticity it recovers its former Figure, when theſe Muſcles ceaſe to act; but tho' this Opinion be received by the learned *Boerhaave*,

Boerhaave, as well as by the generality of other Authors, yet there are many Objections, which render it very doubtful, if not altogether absurd: For when these Muscles act together, they must draw the Eye inwards, and press its Bottom against the Fat, which touches it in that Place: But all Action and Re-action being equal, it follows that the back Part of the Eye must be pressed forewards by the Fat, with as much Force as the Muscles draw the Eye inwards; and consequently, that the Force whereby these Muscles endeavour to lengthen the Eye, by compressing or squeezing its Sides, must be ballanced and taken off, by the Pressure of the Fat, against the back Part of the Eye. The other Objections against this Hypothesis, must be taken Notice of below, to which the Reader must therefore be referred, for saving Repetitions.

Others again are of a quite contrary Opinion, and would perswade us, that when these four streight *Muscles* act together, they render the Eye flat, by pulling it inwards, and pressing its Bottom against the Fat, and that it is again reduced to its former Figure, either by the joint Contraction of the two *oblique* Muscles, or by the inherent Elasticity of its Parts, which ex-

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erts itſelf when the *Streight Muſcles* ceaſe to act: But neither does this Opinion appear probable; for when theſe Muſcles contract, they not only endeavour, by preſſing the Eye againſt the Fat in the Bottom of the Orbit, to render it flat, but likewiſe ſqueeze the Sides of the Eye, and by that means endeavour at the ſame time to render it oblong, which two Actions being equal, becauſe proportional to the ſame Cauſe, *viz.* the Contraction of the Muſcles, and being contrary to one another, they muſt deſtroy each other.

From what has been ſaid, it ſeems very probable, that the Eye can neither become flat nor oblong, either by the Action of the *Streight* or *Oblique* Muſcles. And this does yet further appear from the following Reaſons. *1mo*, Did the Eye accommodate itſelf to the Diſtance of Objects, by any Change in its Figure ariſing from the Contraction of its Muſcles, this Change would be different in different Poſitions of the Eye, and only regular in one Situation of it.

2do, If you preſs your Eye gently with your Finger, all Objects ſeen with that Eye will appear confuſed and undiſtinct, neither will they appear more perfect, at whatever Diſtance they be placed. If you

ask the Reaſon of this Phænomenon, I know no better Anſwer, than that that determined Situation of the ſmall Fibres compoſing the *Retina*, which is neceſſary for diſtinct Viſion, is by the Preſſure of the Finger diſturbed and diſordered: And therefore, it is not eaſy to underſtand, how the ſame Diſpoſition ſhould not be equally diſordered by that ſuppoſed Compreſſion of the Muſcles, which is neceſſary for changing the Figure of the Eye.

3*tio*, A third Argument againſt this Change of Figure in the Eye, is, that in ſome Creatures the *Sclerotica* is ſo very hard as does not allow of any ſuch Change; and this Diſpoſition in the *Sclerotica* is generally obſervable in all Birds and Fiſhes; both which have it bony, from the middle of the Globe, to its fore Part, where it joins the *Cornea*, as has been obſerved by *Aquapendente*, the *French Academiſts*, and many other Anatomiſts. Mr. *Ranby* has obſerved, that this bony Circle in the *Oſtrich* conſiſts of fifteen bony Scales joined to one another, ſo as to make one circular Bone round the *Cornea*, of which he has given a Figure in the *Philoſophical Tranſactions*. And Mr. *Warren* has ſince found, that the *Oſtrich* has this Ring in common with other Fowls both of the Wa-

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ter and Land, with this Difference only, that the Ring in Water-Fowls conſiſts of fifteen, and in Land-Fowls but of fourteen Bones, and that they are ſo diſpoſed, that one Bone lyes over the Ends of two others, then three or four ly over one another like the Scales of Fiſh; then one Bone lyes under the Ends of two others, and then two or three more follow again, like the Scales of Fiſh; but he thinks, that unleſs there be a *luſus naturæ*, Mr. *Ranby*'s Figure does not expreſs it ſo very juſtly as it might be done, which *Ranby* himſelf in another Paper ſeems to acknowledge, (*See Philoſoph. Tranſ. abrid. Vol. VI.*) But whatever be in this, one Thing is certain, that in all Fowls, as well as Fiſhes, a great Part of the *Sclerotis* is hard and inflexible: And particularly in the *Owl*, Mr. *Perrault* ſpeaks as if it were wholly bony, yet I find, that *Peierus* the Son makes it a little ſofter towards the Entry of the optick Nerve. But what makes moſt for our Purpoſe, is, that in ſome Fiſhes the whole of the *Sclerotica* is of a cartilaginous or bony Subſtance; thus it is in the Whale, in which alſo its Thickneſs is more than an Inch, as *Ruyſch* obſerves, (*Theſaur. anatom. maxim. N. LI.*) In the *Sea-Fox*, this Tunicle, tho' thin, was by the *French* Academiſts found

" so hard that it might rather pass for a " Bone than a Cartilage," (*See their Memoirs for the natural History of Animals.*) And the like has been observed by *Steno*, in the *Canis Carcharias*, and some other Fishes of the Canine Kind, *Sclerodis tunicæ pars anterior, & transiucens*, (says he in his *Canis carchariæ dissectum caput*) *quæ cornea dicitur, hic plana erat, reliqua pars verè dura, cæteris in eodem pisce cartilaginibus similis; sic & in avibus, magna sclerodis pars ossea reperitur, &c.* *Sanctorini*, in his *Observationes anatomicæ, cap. IV. sect.* 2. has also a very remarkable Observation to this Purpose: His Words are, *Quoniam nulla sunt, quæ circa oculi musculos adnotanda habemus, de eorundem usu quædam proponere libet: num scilicet, præter ejusdem oculi motum illum sic vel retrahant vel producant, ut vel in planiorem, vel in acutiorem figuram ille conformetur. Hanc me in quæstionem induxit osseam prorsus reperisse in Thinni oculis sclerotidem membranam, ob cujus quidem soliditatem ac duritiem, nullo musculorum vel valentissimo nisu constituta potest figura commutari. Quapropter si in eo pisce quidquam commodi ex ejus figuræ varietate natura speravisset, aliud quodpiam artificium in ejus vicem machi-*

nata

nata fuiſſet, &c. Now from theſe Obſervations it is very plain, that in many Animals it is impoſſible that the Eye can accommodate itſelf to the different Diſtance of Objects, by varying its Figure, the Action of its Muſcles being inſufficient to overcome the Reſiſtance of its cartilaginous or bony and almoſt inflexible Tunicles; and yet it cannot be denied but they have a Faculty of changing the Conformation of their Eyes, and of adapting them to the Diſtance of Objects, as well as other Creatures, which therefore we muſt expect to find ſomewhere elſe than in any of its Muſcles.

It may indeed be ſaid, that though the Change made in the Eyes of Birds and Fiſhes, does not proceed from the Action of its Muſcles, yet it does not from thence follow, that in Man and other Animals, who have the Tunicles of the Eye flexible and yielding, the Contraction of theſe Muſcles does not produce ſome Variation in the Figure of the Eye: This I readily own; yet if we conſider, that Nature is very conſonant and conformable to herſelf in all her Actions, we can hardly doubt but the ſame Cauſe, which in Fiſhes and Birds, accommodates their Eyes to the diſtinct Viſion of Objects at different Diſtan-

ces, does likewiſe produce the ſame Change in the Eyes of Men, eſpecially ſince there is nothing to be found in the Eyes of theſe Creatures, capable of producing that Change, but what alſo obtains in human Eyes.

I am not ignorant, that ſome have feigned certain Fibres going from the *Choroides* to the Cryſtalline in Birds; and others have ſuppoſed, that in Fiſhes there is likewiſe ſome peculiar Diſpoſition for adapting their Eyes to the Diſtances of Objects. But with reſpect to Birds, *Perrault*, and the *French Academiſts* have particularly obſerved, that there is no ſuch Fibres different from thoſe that compoſe the *Marſupium nigrum*, which can never anſwer that End, being adapted to another Purpoſe, to be explained afterwards; and as for Fiſhes, that pretended Mechaniſm is ſo darkly explained, and that only by Authors of ſo little Character and Reputation, that it does not deſerve Credit. But,

4*to*, To put this Matter out of all Diſpute, we muſt have Recourſe to the following Obſervation, *viz.* A Man having a Cataract in both Eyes, which intirely deprived him of Sight, committed himſelf to an Oculiſt, who finding them ripe, performed the Operation, and couched the Cataracts with all the Succeſs could be deſired; but

after

after they were couched, he could not diſtinctly ſee Objects, even at an ordinary Diſtance, without the Help of a very convex *Lens*; which is what every Body has obſerved to be neceſſary to all thoſe who have had a Cataract couched: Neither is the Reaſon thereof difficult; for as a Cataract is not a Philm ſwimming in the *aqueous Humour*, as has been generally believed till of late, but an opacity in the Cryſtalline itſelf; and as the couching of a Cataract conſiſts in introducing a Needle into the Eye, and turning down that opaque Humour below the Pupil, it is evident that the Cryſtalline cannot be diſplaced and turned down to the under Part of the Eye, but the vitrous Humour muſt, in giving way to it, be puſhed into its Place; but becauſe its Denſity is leſs than that of the Cryſtalline, it follows, that the Rays of Light will be leſs refracted, and therefore will not meet at a Point in the *Retina*, but at ſome Diſtance behind it; from whence the Sight muſt be confuſed, unleſs a convex Glaſs, of a due Degree of Convexity, be brought to Aſſiſtance, which, by refracting the Light, may render its Rays more converging, and thus ſupply that Refraction which is wanting in the Eye by the Depreſſion of the Cryſtalline; and this is the

true Reason why there can be no distinct Vision after the couching of a Cataract, unless when Objects are viewed through a convex Glass of a due Degree of Convexity; nor has the Efflux of the aqueous Humour any Concern in this Phænomenon, seeing it is again restored, as was known to *Galen*; but this is not all that happens after the Depression of the Cataract; for it was observed, that the same *Lens* was not equally useful for seeing all Objects distinctly, but that he was obliged, for seeing them distinctly, to use Glasses of different Degrees of Convexity, still the more convex the nearer the Object.

To make this Experiment with great Exactness, and to provide against all Possibility of Mistake, it were proper to cover that Side of the *Lens* which is next to the Eye, with black Paper, in the middle of which, two narrow parallel Slits have been made, whose Distance from one another does not exceed the Diameter of the *Pupil*. By this Means, if the Eye still retains its Faculty of changing its Conformation, a small Object, that is at such a Distance as to appear single through the Slits, when the other Eye is shut, may be made to appear double, by opening both Eyes, and directing them to a nearer or more remote Object, as has been

been explained above; whence, if no ſuch double Appearance can be ſeen, we may conclude with great Certainty, that the Eye has loſt its Power of accommodating itſelf to the Diſtance of Objects. I have never had an Opportunity of making the above Experiment my ſelf; but when any ſuch offers, I deſign to make it in this Manner, or rather to employ the Inſtrument formerly mentioned; which, for its Uſe in meaſuring the Limits of diſtinct Viſion, and in determining with the utmoſt Exactneſs the Strength and Weakneſs of Sight, I have called an *Optometer*. In the mean time, from the Experiment as it ſtands, we may ſafely draw the following Corollaries.

Cor. 1. From what happens in couching the Cataract, the Eye loſes the Faculty of adapting itſelf to the various Diſtances of Objects.

Cor. 2. Did that Change in the Eye, that is neceſſary for ſeeing Objects at different Diſtances, depend upon the Action of its Muſcles, then after the Depreſſion of a Cataract, the ſame *Lens* will anſwer all Objects of whatever Diſtance; but ſince this is not Fact, it follows, that however the Muſcles of the Eye may be ſuppoſed to change a little its Figure, yet this Change is not ſufficient to provide for the diſtinct

Viſion

Vision of Objects at all Distances.

Cor. 3. Seeing that nothing happens in the Eye, in couching the Cataract, but that the Crystalline is depress'd, it follows that the Change made in our Eyes, according to the Distance of Objects, must be attributed to this Humour.

It remains now that we enquire what this Change of the Crystalline is, and by what Mechanism it is produced.

Some maintain, that according as Objects are at different Distances, this Humour becomes more or less convex, which does indeed very well account for distinct Vision at all Distances; for Objects painted on a Sheet of white Paper, by means of a *Lens* plac'd in the Hole of a Window-shut of a dark Chamber, have their Images always distinct at whatever Distance they be from the Window, provided that the *Lens* be of a Convexity answerable to that Distance.

Others again are of Opinion, that the *Crystalline* never changes its Figure, but that it is moved to and from the *Retina*, according to the Distance or Proximity of the Object in View; and this also does equally well account for the distinct Appearance of Objects at all Distances, as is evident from the Laws of Opticks, as well as from the vulgar Experiment of casting the

Species

Species of Objects from abroad, upon a Sheet of white Paper, by means of a *Lens* plac'd at a Hole in the Window-shut of a dark Chamber: for the Picture will always be distinct, at whatever Distance the Object may be, provided that the Paper be at a due focal Distance behind the *Lens*.

Those that embrace the first Opinion say, that the *ligamentum ciliare*, which arises all round from the Inside of that Circle of the *Choroides* where it joins the *Uvea*, does by its Contraction draw the Edge of the Crystalline, to which it is attach'd all round, towards that Circle; and by that means makes it broader and flatter than before, when Objects are at a Distance from the Eye; and that when we view nearer Objects, this Ligament is relax'd, and the Crystalline recovers its Convexity by the Elasticity of its Parts: And to render this Opinion still the more probable, they contend that it is for this End that Nature has made the outer Part of this Humour of a Substance easily flexible and yielding, that it may with greater Facility yield to the Contraction of this Ligament. But if we observe accurately the Situation of the *ligamentum ciliare*, we will find that it is such as disqualifies it for rendring the Crystalline more flat, by increasing its Breadth;

for

for its Fibres are not in the ſame Plane wit
the Cryſtalline, but have an oblique Dire
ction, as in *Fig.* 9. where C is the cryſtal
line Humour, *a*C*a* its tranſverſe Diameter
ao, *ao* the *ligamentum ciliare* (ſometime
alſo called the *ciliary Proceſs.*) Now i
order to draw out the Cryſtalline into
broad flat Figure, or which is a juſter wa
of conceiving this Matter, in order to dra
out and extend its Capſule, ſo as it ma
compreſs the Cryſtalline into this Figure, i
ſeems neceſſary it ſhould be drawn accord
ing to the Direction of the Lines, *ab* and *a*
which are in the ſame Plane with the tran
verſe Diameter of this Humour *a*C*a*; bu
this can't be performed by the *ligamentum*
ciliare, becauſe its Direction is oblique
and therefore it can never by its Contracti
on change the Figure of the Cryſtalline
Nor is this Opinion rendred more probabl
from the different Subſtances of which th
Cryſtalline is compoſed: It is indeed true
and has been obſerved by Anatomiſts, tha
though this Humour be all very ſolid, in
reſpect of the other Humours of the Eye
yet it is not all throughout of the ſame Con
ſiſtence, being externally like a thick Ge
ly, but internally, towards its Center, co
a Conſiſtence equal to that of hard Sewet
This external ſoft Part of the Cryſtalline i
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by ſome reckoned to be about the Third of its whole Bulk; and, in Fiſhes, this Difference of Conſiſtency is in a particular Manner remarkable, who are therefore ſaid to have a double Cryſtalline, the one very ſmall and ſolid, in the Center of the other, which is larger, but of a ſofter and leſs ſolid Subſtance. This little Cryſtalline, which is as it were a *Nucleus* or Kernel to the other in whoſe Center it is placed, is never found wanting in the Eyes of Fiſhes; and indeed in all Animals, ſo far as has been obſerved, this Humour is always much ſofter externally than towards its Center. But it does not from this follow, that Nature has thus ſoftned the external Part of this Humour, that its Figure may be the more readily varied for ſeeing diſtinctly at all Diſtances, but for another very wiſe and neceſſary Purpoſe: For it is certain that the Rays of Light which fall upon the Extremities of the Cryſtalline, by reaſon of their greater Obliquity, muſt be more refracted than thoſe which fall upon its Middle, near its Axis, by which means they will be made to meet at different Diſtances behind the cryſtalline Humour, theſe towards its Extremity nearer, and theſe near its Axis at a greater Diſtance; ſo that it is impoſſible for all to be united exactly upon the *Retina*,

tina, for rendring the Sight diſtinct: And therefore, to prevent this Inconveniency, provident Nature, which is never known to do any Thing in vain, but always for the beſt Purpoſes, has very wiſely, towards the Center of the Cryſtalline, made its Subſtance more denſe and ſolid; that the Rays of Light that fall on the Cryſtalline near its Axis, may, in paſſing this *Nucleus*, have their Refraction increas'd, and by that means may be made to converge and meet at the ſame Point with theſe that paſs the Cryſtalline towards its Edge or Extremity.

This is the Reaſon why the Cryſtalline of all Animals is more ſolid in its Center than externally, and why in Fiſhes this Difference is ſo remarkable; for in them this Humour being ſpherical, as has been obſerved above, the Rays that fall thereon, at ſome Diſtance from its Axis, by reaſon of their great Obliquity, would be made to meet at a greater Diſtance from the Point of Union of the other Rays that paſs near its Center, than in Land-Animals who have this Humour lenticular; and therefore, to prevent this Inconveniency, which would have rendred the Sight prodigiouſly undiſtinct, Nature has provided them with that ſmall ſolid Cryſtalline in the Center of the

other

other, whoſe Denſity far exceeds that of the *Nucleus* of Land-Animals.

All this might be demonſtrated mathematically; but if a Glaſs Lens be covered with opack Paper in which there are two Holes, one at the Axis of the Glaſs, and another towards its Edge, and if this Glaſs be plac'd in the Hole of the Window-ſhut of a dark Room, ſo as to refract a Beam of the Sun's Light upon a Sheet of white Paper, plac'd at a due focal Diſtance behind the Lens, it will be found that the Beam that paſſeth the Hole towards the Edge of the *Lens*, will cut the *Axis* before the *Focus* of the Glaſs, and fall on the oppoſite Side of the Paper. From all which it is evident, that the different Conſiſtency obſervable in the cryſtalline Humours, does not prove that they are rendred flatter by the Contraction of the *ciliary Proceſs*, as ſome Authors would perſuade us, but to diminiſh the Refraction where the Rays fall moſt obliquely, and thereby to diſpoſe them to meet in the ſame Point with thoſe which paſs through its Middle, which was abſolutely neceſſary for diſtinct Viſion, unleſs the Pupil had been much leſs than it now is, in which Caſe our Sight had not been near ſo clear as it is at preſent.

If it ſhould be ſaid, that the Cryſtalline changes

changes its Conformation, and becomes more or less convex, by the Action of certain muscular Fibres that enter its Composition, it is incumbent on those who entertain this Opinion to shew us these Fibres. The Crystalline, when dry'd, doth manifestly enough appear to be made up of many thin concentrical *Laminæ* or Scales lying one upon another, of which Mr. *Lewenhoeck* reckons there may be 2000 in one Crystalline from the Outermost to the Center, and every one of these Scales, he saith, he hath discovered to be made up of one single Fibre, or finest Thread, wound in a most stupenduous Manner this way and that way, so as to run several Courses, and meet in as many Centers, and yet not to interfere or cross one another in any one Place. In *Oxen*, *Sheep*, *Hogs*, *Dogs* and *Cats*, the Thread spreads into three several Courses, and makes as many Centers; in *Whales* five, but in *Hares* and *Rabbits* only two; in the whole Surface of an *Ox*'s Crystalline, he reckons there are more than 12000 Fibres juxta-posited. But for the better understanding the Manner of this admirable Piece of Mechanism, I must refer to the Cuts and Descriptions in his Works, and in the *Philosophical Transactions*, *num.* 165 and 293, from which it will appear that this Disposi-

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tion is but ill qualified for changing the Figure of the Cryſtalline, and for adapting it to the Diſtance of Objects. But ſuppoſing it were otherwiſe, and that it could be made appear that the Diſpoſition is well fitted for that Effect, I am afraid it would not be ſo eaſy to prove thoſe Fibres to be muſcular, and capable of Contraction.

There is yet another Argument againſt this Hypotheſis of the *Cryſtalline*'s changing its Figure, by means of muſcular Fibres that enter its Compoſition, which muſt not be omitted; and that is, that it has no viſible Attachment or Communication with any Part of the Body, but is kept in its Place by means of a *membranous Capſule*, with which it has not the leaſt Connexion; whence it is, that when this *Capſule* is opened, the Cryſtalline eſcapes of itſelf without the leaſt Violence, as has been obſerved by *Maitre-Jean* in his *Maladies de l'œil, chap.* xi. and by Dr. *Petit* in the *Memoires de l'Academie Royale an.* 1730, who therefore make no Scruple to affirm, that of all the Parts of our Body, the Cryſtalline is the only one that has no Continuity with the Parts adjacent, by any Fibre, Blood-veſſel or Nerve: And this Opinion is very much ſtrengthned by a Paſſage I find in *Steno*'s *canis carchariæ diſſectum caput.*

Cryſtallini humoris propria tunica contenti (ſays he, ſpeaking of this Animal) *ſubſtantia triplex erat, intima, centrum, centroque vicina loca occupans, dura, & ex lamellis compoſita erat, quæ integræ, cryſtalli inſtar, diaphanæ apparebant, ſectæ vero albæ ſimul & opacæ evadebant; extima cryſtallini ſubſtantia, tunicæ proxima, aquæ inſtar diffluebat; reliqua, ut centrum inter & tunicam, medium locum invenerat, ſic etiam conſiſtentiæ mediæ erat, viſciditate ſua gluten æmulans. Solidus globus viſco ſuo circumdatus liberè in aqua volvebatur.* From theſe Words it is plain, that the Author, who was one of the moſt accurate Anatomiſts in his Time, diſcovered no Attachment of the *Cryſtalline* to its *Membrane* or *Capſule*, which, had there been any, could not eaſily have eſcaped his Obſervation, where ſo much Water ſurrounded the ſolid Cryſtalline; and this will be ſtill more evident, if we conſider the following Paſſage, from which it appears that he had frequent Opportunities of repeating the like Obſervations. See his *diſſectio piſcis ex canum genere*, where, ſpeaking of the *Cryſtalline* in one of thoſe canine Fiſhes, he ſays, *Cryſtallini humoris ſubſtantia triplex erat; media dura, & ex lamellis compoſita; huic undique adhærens alia*

alia multum glutinoſa; tertia tunicæ proxima, omninò aquea, ſed & hoc piſcibus aliis plurimis datum eſt.

The famous *Morgagni* has alſo obſerved, that there is Water in the *Capſule* of the *Cryſtalline*, not only in Men, but in ſeveral other Creatures, (*Adverſar.* vi. *p.* 90.) and yet he takes no Notice of any Attachment. But of all the Authors that have written on this Subject, Dr. *Petit* ſeems to have carried his Obſervations the furtheſt; for he found this Water not only in the human Eyes, but in the Eyes of *Dogs*, *Cats*, *Wolves*, *Hares*, *Rabbits*, *Sheep*, *Lambs*, *Calves*, *Oxen*, *Horſes*, *Turkies*, *Ducks*, &c. but could never diſcover the leaſt Attachment, though he ſeems to have been at a good deal of Pains in ſearching after it. See *les Memoires de l'Academie Royale an.* 1730.

Had the *Cryſtalline* any Continuity with its *Capſule*, it is probable that *Ruyſch*'s ſubtile Injections would have reached it; but we find he could never go further than its Membrane, and that only by puſhing forward the Blood in its Veſſels by the ceraceous Matter, from which they became conſpicuous, though the ceraceous Matter itſelf could never be made to enter them, (*Ruyſch. Theſaur.* 2. *locul. arc.* 4.) See-

ing then that the *Crystalline* has no visible Attachment or Communication with any Part of the Body, it can never receive into its Fibres any Blood or Spirits; and consequently it cannot be adapted to the Distance of Objects by the Contraction of those Fibres.

If any body should ask me, how it is possible for the Crystalline to be nourished without having some Communication with the neighbouring Parts, from which it may derive Blood and Spirits? To this I answer, That I see no Absurdity in giving it a kind of vegetative Life, and in supposing that it draws Nourishment from the Water in which it fluctuates, as *Maitre-Jean* and *Petit* have supposed; and this may be the Reason, whence it is that when this Water is wanting, as sometimes happens in morbid Cases, the *Crystalline* becomes dry and opack, much like what it is when taken out of the Eye and dried, as *Brisseau*, *Morgagni* and *Petit* have observed.

The last Opinion concerning the Change made in our Eyes is what we embrace, and consists in the Motion of the Crystalline, whereby the Distance betwixt it and the *Retina* is increased or diminished according to the different Distances of Objects; so that at whatever Distance Objects are placed

ced, the *Retina* is always at a due focal Diſtance behind the Cryſtalline.

Now the *Ligamentum ciliare* is an Organ whoſe Structure and Diſpoſition excellently qualify it for changing the Situation of the Cryſtalline, and removing it to a greater Diſtance from the *Retina*, when Objects are too near us; for when it contracts, it will not only draw the Cryſtalline forwards, but it will alſo compreſs the vitrous Humour lying behind it, by which Compreſſion it muſt preſs upon the Cryſtalline, and puſh it forwards further from the *Retina:* For underſtanding which, let C (*Fig.* 9,) be the *Cryſtalline*, and let the curve Lines *ao*, *ao* repreſent the *Ligamentum ciliare*; it is eaſy to ſee that when this Ligament contracts, it muſt draw the *Cryſtalline* forwards in the Direction of the right Lines *aod*, *aod*, by which means this Humour will be brought nearer the Fore-part of the Eye *oo:* But this is not all, for the Fibres, compoſing this *Ligament* or *muſcular Proceſs*, do not run in a ſtraight Line from their Origin in the *Choroides* to their Inſertion in the Edge of the *Cryſtalline*, but by their Inflexion form a Hollow, behind which lies the vitrous Humour, as repreſented in the Figure; and therefore when they contract, they muſt come nearer to the ſtraight Lines

ao, *ao*, by which means this Concavity will become leſs, and the vitrous Humour will be compreſs'd; which therefore muſt, by preſſing on the Back of the Cryſtalline, puſh it forwards further from the *Retina*, when we look at near Objects, its Axis all this while remaining the ſame.

Plempius aſcribes the Diſcovery of the Uſe of this *Ligament*, in changing the Conformation of our Eyes, to the celebrated Philoſopher and Mathematician *Johannes Keplerus*, of which Anatomiſts need not be aſhamed, it being only from mathematical Principles that the Neceſſity of any ſuch Change was ever diſcovered. But in explaining this Matter, not only *Kepler*, but *Plempius* himſelf ſeems to have fallen into a Miſtake; for they ſuppoſe that, by the Contraction of this Proceſs, the Sides of the Eye are drawn inwards towards the *Cryſtalline*, by which means the Eye is elongated, and the *Retina* is puſh'd back to a greater Diſtance behind the *Cryſtalline* when Objects are near; which is repugnant to the above-noticed Situation of this Proceſs, as well as to the Hardneſs and Inflexibility of the *Sclerotis* of ſeveral Animals. See *Plemp. Opthalmogr. lib.* iii. *cap.* 9.

M. de la Hire denies this Motion of the Cryſtalline, as well as all other Changes made

made in the Conformation of the Eye, all whoſe Arguments have already been examined at ſome length, excepting thoſe taken from the Structure of the Parts; which now we muſt conſider in ſo far as they have any Relation to this above deſcribed Motion of the Cryſtalline. This Author maintains that it is impoſſible the Cryſtalline can change its Situation, becauſe the *ciliary Ligament* is not muſcular, and conſequently has no Power of Contraction; and of this Opinion are likewiſe a great many Anatomiſts, and in particular *Hovius*; but it appears that all of them have been led into this Miſtake, by an unjuſt Notion they have entertained about the Colour of Muſcles. Every body knows that our Muſcles are generally of a red Colour, but it does not from thence follow that what is not red is not muſculous, the muſcular Fibres of the Guts and Stomach have ſcarce any thing of Redneſs in their Colour, and it is alſo certain that the Pupil does contract and dilate itſelf according as Objects are more or leſs luminous, and yet none of the Fibres which perform that Action are in the leaſt red; whence it follows, that the Fibres of the *Ligamentum ciliare* are not to be deprived of a Power of Contraction, becauſe of a Colour different from what generally ob-

tains in other Muscles; nor are we to be surprized that so many accurate Anatomists, after a careful Examination of this Process, have not scrupled to affirm it to be truly muscular.

On what has been said, I shall now make a few obvious Reflexions by way of Corollary. And

1*st*, Seeing that the natural State of the *Ligamentum ciliare*, like that of all other Muscles, is a State of Relaxation, it is easy to see that the Crystalline must then be as near to the *Retina* as possible; whence it follows, that the Eye is naturally disposed to see distinctly only distant Objects, and that that Disposition whereby it is fitted for the distinct Vision of near Objects, arising from the Contraction of this *Ligament*, is a State of Violence introduced at the Command of our Will: For Confirmation of which we might appeal to every one's Experience, who we doubt not will acknowledge, that when they are sitting carelessly, without attending to any Object, nothing at an ordinary Distance appears distinct, till a certain Effort be exerted, which will be remarkably greater in Proportion as the visible Object is nearer; and this also agrees perfectly well with that necessary Connexion and Dependence that

Habit

Habit and Cuſtom has eſtabliſhed betwixt the Motions of the *Cryſtalline* and certain correſponding Motions in the *Axes of Viſion*, which makes it impoſſible for us to direct our Eyes to any Object, without at the ſame time giving them that Diſpoſition that is neceſſary for ſeeing diſtinctly at that Diſtance; for as our Eyes are naturally adapted for ſeeing diſtinctly only diſtant Objects; and as that Diſpoſition, whereby they are fitted to near Objects, is a State of Violence that requires an Effort greater or ſmaller, as the Object is nearer or further off, ſo the Axes of our Eyes are naturally parallel, which is the Direction proper for diſtant Objects; and when they are directed to a near Object, an Effort muſt be exerted, which alſo will be greater or ſmaller, in Proportion as the Object is nearer or further off; which Harmony and Agreement of Motions I eſteem a very great Confirmation of this Doctrine.

2*dly*, From what has been ſaid we may clearly ſee, whence it is that our Eyes are ſo ſoon fatigued in looking to near Objects, which ſeldom happens when the Object is at any conſiderable Diſtance; for when the Object is near, an Effort muſt be exerted, both by the Muſcles of our Eyes, for giving them the neceſſary Direction,

and

and by the *Ligamentum ciliare*, for giving them the necessary Conformation; which Effort being always greater in Proportion as the Object is nearer, must be painful and laborious when the Object is very nigh; whence arises that Fatigue so often felt, in looking long at near Objects; but when the Object is at any considerable Distance, so great an Effort is not required, especially by the *Ligamentum ciliare*, which, by some Experiments taken notice of above, is in my Eyes totally relaxed at the Distance of twenty seven Inches, whence at that and all greater Distances, no Uneasiness can be felt, unless the Object be too bright and luminous, but what arises from the Direction of my Eyes, which is very inconsiderable; and therefore my Eyes are not soon fatigued in looking at an Object, whose Distance is greater than twenty seven Inches; but when the Distance is less, they soon become sensible of an Uneasiness, which being proportionally greater, as the Object is nearer, does soon require that the Eyes be relaxed; and this is the true Reason, why none of us are able to look long to a very nigh Object.

3*dly*, From this also it is easy to understand, whence it comes to pass, that after the Eye has been very attentive, in considering

dering an Object at a certain determined Diſtance, it cannot preſently ſee another Object diſtinctly, at a greater or leſs Diſtance, though both Objects ſeem to touch one another, being nearly in the ſame Line: For ſince the Conformation of the Eye muſt be fitted to the Diſtance, ſome time will be required for finding out by repeated Trials, that preciſe Diſpoſition which is neceſſary for ſeeing the Object at that Diſtance; and therefore it muſt appear confuſed and imperfect, till the Eye has exactly adapted itſelf to the Diſtance of the Object.

4thly, This Motion of the *Cryſtalline*, whereby our Eyes are accommodated to the Diſtance of Objects, being intirely voluntary and ſubjected to our Mind, which, being a wiſe Agent, wills its Motion that Objects may not appear confuſed, it follows, that when by any other Means this Confuſion is taken off, the Mind will not then change the Conformation of our Eyes, unleſs there be ſomething elſe, that can influence it to ſuch an Action; and this, after many Conjectures upon the Matter, I take to be the true Reaſon why the Eye is not adapted to the Diſtance of Objects, viewed through a ſmall Hole made in a Card; and why, when viewed through ſeveral

veral ſmall Holes, whoſe Diſtance from each other does not exceed the Diameter of the Pupil, they appear multiplied according to the Number of Holes, as has been obſerved above.

5thly, Though this Motion of the Cryſtalline be ſubjected to our Mind, which, when the Object appears confuſed, changes its Situation, till by repeated Trials it finds out the preciſe Place it ought to poſſeſs, for rendring our Sight as diſtinct as poſſible; and though this Confuſion in our Sight ſeems to be the only thing that ſhould influence our Mind to ſuch an Action; yet by reaſon of a habitual or cuſtomary Connexion that has grown up between the Motions of the *Cryſtalline* and correſponding Motions of the *Axes of Viſion*, theſe Motions come at laſt always to accompany one another, and that ſo neceſſarily as to make it impoſſible for us to ſeparate them by any Act of Volition; Thus, when we view any Object at two Foot Diſtance, we not only accommodate our Eyes to that Diſtance, but we alſo move our Eyes, ſo as their Axes produced may meet in ſome Point of the Object; whence it comes to paſs, that theſe Motions, which at firſt had no neceſſary Connection or Dependence on each other, do in Time come to cohere

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ſo cloſely, as to make it impoſſible for us to direct our Eyes to an Object at two Foot Diſtance, without at the ſame Time giving them that Diſpoſition that is neceſſary for ſeeing diſtinctly at that Diſtance; and what has been ſaid of Objects at two Foot Diſtance, is alſo true of Objects at all other Diſtances within the Limits of diſtinct Viſion. Whence it is eaſy to ſee, how our Eye may be made to change its Conformation, when an Object is viewed through a ſmall Hole made in a Card, tho' by Reaſon of the ſmallneſs of the Hole, the Object appears always diſtinct, even when the Eye is not adapted to its Diſtance; for ſeeing the Motion of the Cryſtalline is, by Cuſtom and Habit, made to follow a correſponding Motion in the *Axes* of our Eyes, it follows, that by changing the Direction of our Eyes, the Eye muſt alſo, at the ſame time, accommodate it ſelf to the Diſtance at which the *optick Axes* meet. It is for this Reaſon, that when a ſmall Body appears ſingle, when viewed through two ſmall Holes, whoſe Diſtance does not exceed the Diameter of the Pupil, it may be made to appear double, and if its Diſtance be ſuch as makes it appear double, the Diſtance betwixt the Appearances may be increaſed or diminiſhed, and all this only by changing the Direction of our Eyes.

6thly,

6thly, This Motion of the Crystalline, by which our Eyes are adapted to the Distance of Objects, has its Limits beyond which it cannot go; whence it is, that none of us can see distinctly with the naked Eye, but within certain Limits, beyond which, if the Object be placed, it must appear confused more or less, as it is further removed from the Limits of distinct Vision. These Limits are at different Distances, according to the Difference of Peoples Eyes; and very often in the same Man, both Eyes have not the same Limits, which is oftentimes of the same Use, as if the Limits of both Eyes were more distant from one another; for one may see an Object distinctly enough with only one Eye; but if the nearest Limit of one Eye is further off than the furthest of the other, then near Objects and distant Objects may be seen distinctly, but the intermediate ones must appear confused, which is a Case that is very apt to surprise such as despise or neglect Theory.

7thly, The *Ligamentum ciliare* being the only Instrument by which our Eyes can be fitted for seeing distinctly at different Distances, it follows, that whatsoever affects the Oeconomy and Action of this Ligament, must also affect our Sight. Thus,

1*mo*, When it has become paralytick, no near Object will appear diſtinct; for an Example of which, ſee *Foreſti obſervationes, Lib.* XI. *Obſerv.* XXXVI. His Words are, *Generoſus vir & Dominus de Benthuyſen, anno* 1567, *menſe Majo cum ad eum accitus eſſem, conquerebatur ſe propius admota hebetius videre, longinqua verò optimè, &c.*—*Quibus præſidiis tandem hoc vitium ceſſavit, &c.* Nor are we to imagine that the Caſe here was only a common *Viſus ſenilis*: For who is it that calls a Phyſician on ſuch an Occaſion? And as this Diſeaſe never yields to Medicine, it would not have been ſaid, *Quibus præſidiis tandem hoc vitium ceſſavit.*

2*do*, If this Ligament ſhould be convulſed, no diſtant Object will appear diſtinct. We have a beautiful Caſe to this Purpoſe recorded by *Timæus*, which I ſhall alſo ſet down in the Author's own Words: *Studioſus quidam juvenis* (ſays he) *queritur ſe menſæ aſſidentem legere poſſe etiam minutis literulis conſignata, non tamen internoſcere ſi qui hominum conclave ingrediuntur, donec proximius accedant, longius vero diſſita planè ſe non cernere: duravit iſte affectus jam ferè ſeſquiennio. Timæi Caſ. medicinal. Lib.* I. *Caſ.* XXV. The Author indeed reſolves this Caſe into a Thickneſs

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and Muddiness of the Humours of the Eye; but to me it seems more reasonable it should have been resolved into a Contraction or Spasm of the *Ciliary Process*, and if, by means of a concave Glass of a due Degree of Concavity, distant Objects could have been distinctly seen, (of which the Author has taken no Notice) this would have served as a Proof of our Conjecture: For on *Timæus*'s Supposition, as also on the Supposition, that this Symptom proceeded from a certain Degree of Insensibility in the *Retina*, or immediate Organ of Sight, such a Glass would have rendred the Sight yet more dark and confused than before.

From this we may possibly see why in hysterick and nervous Cases, a certain Dimness of Sight is so frequently complained of; and in particular, why *Piso*'s Matron was seized therewith for an Hour before her hysterick and convulsive Paroxysm, (*Piso de Colliv. seros. Obs.* XXV. *p. m.* 146.) For though this Symptom may arise from a Numness or certain Degree of Paralysis, and Insensibility in the optick Nerve, yet as certain it is, that it may also procede from a Spasm in this muscular Process; and seeing both are equally possible, I see no Reason for admitting the one and rejecting the other, without a very

exact

exact and impartial Examination of all the Phænomena, which in ſuch Caſes are commonly overlook'd. The great *Hippocrates*, in many Parts of his Writings, has obſerved this Dimneſs of Sight to be the Attendant, as well as the Harbinger of Spaſms and convulſive Motions; whence it ſeems reaſonable to ſuppoſe, that in many ſuch Caſes it ſhould alſo itſelf be occaſioned by a Spaſm in this Proceſs, whereby the Eye is diſqualified for ſeeing diſtinctly at an ordinary Diſtance. But all this I propoſe only by way of Conjecture, leaving it to be further examined by others, as Occaſion ſhall offer. In the Caſe of ſome Poiſons, the Matter ſeems ſomewhat plainer; for as *Nicander*, *Dioſcorides*, and others have long ago obſerved, that this Dimneſs and Obſcurity of Sight, together with Spaſms and Convulſions of various Kinds, are the common Conſequences of *Hemlock* taken internally, ſo it ſeems pretty evident from a Paſſage in *Ægineta*, that this does not procede from any Degree of Inſenſibility in the Organ of Viſion, but from a Spaſm in this Proceſs. See *Lib.* V. *Cap.* XLI. where, ſpeaking of this Subject, the following Words are very remarkable: "The Sight "becomes ſo dim, that a Man is wholly

" deprived of the Sight of distant Objects." But I must go on.

3*tio*, If this muscular Process should be paralytick in one Side, and sound in the other, the Crystalline must get an oblique Situation, when we look at near Objects, whence they will not appear distinct, unless the Eye be turned aside from the Object. And,

4*to*, If this same Process is convulsed on the one Side, while the other Side is healthful, the Crystalline will also get an oblique Situation, but not unless we view distant Objects, in which Case also it will be necessary to turn our Eye away from the Object it would view, that its Picture may fall on the *Retina* towards the *Axis* of the Eye, where it is most sensible. But,

5*to*, If in the one Side it should be convulsed, whilst it is paralytick in the opposite Side, the Crystalline will always have an oblique Position, at whatever Distance the Object may be placed; and therefore the *Strabismus* arising from this Cause, must be constant and uninterrupted; whereas, in the two former Cases, it only takes Place in certain Circumstances. But for the better understanding what has been said on this and the two immediately preceding Heads, it may be proper to review what I have said

on the Subject of the *Strabiſmus* in the former Part of this Eſſay; from which it will alſo appear, that in all theſe Obliquities of the Cryſtalline the Object will not be ſeen in its proper Place, where it is ſeen with the other Eye, but will be thence tranſlated to ſome other Place, from which Tranſlation it muſt neceſſarily appear double.

6*to*, When this Ligament has become rigid and ſtiff, the Cryſtalline will have but very little Motion, whence the Limits of diſtinct Viſion will be very narrow: Thus it is with all thoſe who are much employed in any ſubtile Work, ſuch as Engravers, Jewellers, Watchmakers, Painters in Miniature, *&c.* who are very apt to become ſhort-ſighted from their conſtant Application to ſmall Objects, which cannot be diſtinctly ſeen but at a very ſmall Diſtance, and therefore they are obliged, by the Contraction of this *Ligament*, to bring the Cryſtalline as near to the *Uvea* as poſſible; but all Muſcles that continue long in the ſame State become rigid and ſtiff, and loſe much of their Activity: And therefore, this *Ligament*, by its conſtant Contraction, muſt at laſt ſhrink, and have its Fibres ſhortned, which will keep the Cryſtalline fixed in that Situation, by which the Eye is diſqualified for ſeeing diſtant Objects di-

ſtinctly. This has been obſerved by *Ramazzini, de morbis artificum Cap.* XXVI. who therefore judiciouſly adviſes all ſuch, from time to time to intermit their Work, and recreate their Eyes with a Diverſity of Objects, leſt they ſhould loſe their Mobility and become ſhort-ſighted. The Reverſe of this Diſeaſe happens to ſuch as are ſeldom employed in obſerving near Objects, but who from their Infancy have accuſtomed themſelves to look much to diſtant Objects, ſuch as Hunters, Falconers, Sailors, *&c.* In thoſe this Ligament is much relaxed, by which they can ſee at a great Diſtance; but by reaſon they are ſo little accuſtomed to obſerve near Objects, it loſes much of its Faculty of Contraction, whence they cannot accommodate their Eyes to near Objects: And thus we ſee how the *Viſus ſenilis*, as well as the *Myopia*, may be acquired by Uſe and Cuſtom. But I muſt go on.

8*thly*, The eighth and laſt Reflection I ſhall make on this Subject, ſhall reſpect the Cauſe of this Change of Conformation in our Eyes, which is either *efficient* or *final*.

As to the *efficient Cauſe*, it has been already demonſtrated, that this lies in the *Ligamentum ciliare*, which being muſcu-

lar,

lar, does by its Contraction change the Situation of the *Cryſtalline*, according as Objects are nearer or further off. But leſt it ſhould be imagined, that our Mind does not preſide over this Motion of the *Cryſtalline*, by reaſon we are ſo very little conſcious of its Influence, it muſt here be obſerved, that there are many other Motions that are no doubt voluntary and depending on our Mind, of which we are every bit as little conſcious. No body denies but the Mind preſides over thoſe Muſcles which tune the Ear, and yet we are not conſcious of their acting. The Motions of the Eye-lids are alſo all voluntary, though we are often inſenſible of them, and even in many Caſes cannot, by any Act of Volition, hinder them to move in a particular Manner: Thus, when the Eyes are turn'd up or down, the Eye-lids always follow their Motion, and keep at the ſame Diſtance from the Pupil; and if a Body be haſtily moved towards our Eyes, they will ſhut without our being conſcious thereof: Neither is it in our Power to do otherwiſe, becauſe we have accuſtomed ourſelves to do ſo on the like Occaſions; for ſuch is the Power of Cuſtom and Habit, that many Actions which are no doubt voluntary, and procede from our Mind, are in certain Circumſtan-

ces rendred so necessary, as to appear altogether mechanical and independent on our Wills; but it does not from thence follow, that our Mind is not concerned in such Motions, but only that it has imposed upon itself a Law, whereby it regulates and governs them to the greatest Advantage. In all this there is nothing of intrinsical Necessity; the Mind is at absolute Liberty to act as it pleases, but, being a wise Agent, it cannot choose but to act in Conformity to this Law, by reason of the Utility and Advantage that arises from this Way of acting: Thus the Ear is tuned to different Sounds, the Eye is accommodated to Objects at different Distances, the Pupil is proportioned to the Intensity and Weakness of Light, while at the same Time we are not conscious of our having done any Thing; and when these and such like Motions have become necessary in certain Circumstances, so as to render any other Motion impossible, this does not make them mechanical and independent on our Will; but only shews us, that the Mind, which at first always acted from a Principle of Interest, comes at length to be determined by Habit and Custom, without examining how far such Motions may be profitable or hurtful to us, or at least without being sen-

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ſible of any ſuch Examination: And this is the only Reaſon can be given why none of us are now able to move our Eyes differently, though when Children we were poſſeſſed of that Power, and with reſpect to the Eye-lids, the Caſe is exactly the ſame; for though we are not now at Liberty to keep them open when any Thing is haſtily moved towards our Eyes, yet that this procedes intirely from Cuſtom, and not from any abſolute or mechanical Neceſſity in the Thing itſelf, is evident from this ſingle Conſideration, that ſome may be found who can keep them open, though the Organs ſubſervient to their Motions are the ſame as in other Men. Thus it was with the two *Roman* Gladiators taken Notice of by *Plempius* (*Opthalmogr. Lib.* I. *Cap.* II.) who being of uncommon Fortitude and Courage, had not accuſtomed themſelves on every trifling Occaſion to ſhut their Eye-lids for the Defence of their Eyes, whence their Motions continued arbitrary in the ſtricteſt Senſe. Thus alſo it ſeems to have been with that excellent Philoſopher *Socrates*, who in the Judgment of *Apollo* was the wiſeſt Man on Earth; and yet, for no better Reaſon than that, to accuſtom himſelf to Patience, he was wont to ſtand for a whole Day like a Statue, without the

least Motion, not so much as of his Eyes or Eye-lids, (*Gell. Noct. Att. Lib.* II. *Cap.* I.)

But the Matter does not stop here; our Mind does not only preside over the Motion of the *Crystalline*, and such other Motions as are commonly said to be voluntary, but there is good Reason to suspect, that it extends its Dominion and Influence even over all the *vital* and *natural Motions*.

Some very great Philosophers, and particularly *Des Cartes* and his Followers, have been of Opinion, that our Mind always thinks, and yet this is what we are often very little conscious of; and if the Mind can think without our Knowledge, I see not why it may not also be allowed to exert its active Power in the Government of the *vital* and *natural Motions*, without our Knowledge or Attention.

I know it has been alledged by *Locke* and others, That all the Thoughts and Operations of the Mind must necessarily be attended with Consciousness; from whence it may be argued, that the Mind is not concerned with these Motions, because it is altogether insensible of its Influence. But without determining, how far the Thoughts and Operations of the Mind may or may not imply Consciousness, which is a metaphysical Question I leave to be disputed by those

thoſe who have better thought of that Matter; it is ſufficient for my preſent Purpoſe to have ſhewn in a few of many Inſtances that might have been brought, that there are Motions unqueſtionably voluntary and depending on the Mind, which by Cuſtom and Habit have become ſo eaſy as to be performed without our Knowledge or Attention, and that ſo neceſſarily as to make it impoſſible for us, by any Effort of Mind, to hinder them from going on in their uſual Manner. And ſeeing every one's Experience and Obſervation may afford him many Inſtances of ſuch Motions as theſe, I would gladly know why the *vital* and *natural* Motions ſhould be eſteemed of a different Kind.

That they cannot be accounted for from Mechaniſm alone, is very certain; for all the Hypotheſes that have hitherto been, or may hereafter be invented, for explaining thoſe Motions mechanically, do and muſt procede upon the Suppoſition of the Poſſibility of a perpetual Motion. By a perpetual Motion, I mean an uninterrupted Communication of the ſame Degree of Motion, from one Part of Matter to another, in a Circle, ſo as perpetually to return undiminiſh'd upon the firſt Mover, which, in the preſent Conſtitution of Things, is repugnant

gnant to the Laws of Nature; for seeing *all Motions and Changes made in the Motions of Bodies are always proportional to the impress'd moving Force*; and seeing all Motions on this Globe are performed in a resisting Fluid, *viz.* the Air, a considerable Quantity of the Motion must be spent in the Communication on this *Medium*; and consequently it is impossible the same Quantity of Motion should return undiminish'd upon the first Mover, which is necessary toward a perpetual Motion. Moreover, the Nature of all material Organs is such, that there is no avoiding a greater or lesser Degree of Friction, though the Machine be form'd according to the exactest Principles of Geometry and Mechanicks, there being no perfect Congruity, nor exact Smoothness in Nature: And this also must very considerably diminish the communicated Force; so that on both these Accounts it is impossible there should be a perpetual Motion, unless the communicated Force were so much greater than the generating Force, as to recompense the Diminution made herein by these Causes; so that the impress'd Motion may return undiminished to the first Mover: But that being contrary to the above-mentioned Law of Motion, it is clear that the Motion must continually decrease, till

till it at laſt ſtop, and conſequently there can be no perpetual Motion in the preſent State of Things: *Liquet ex calculo mathematico*, ſays the learned Dr. *Clarke* (in *Rohault. phyſ.* § 1. *cap.* 22.) *omnem de motu perpetuo quæſtionem eo redire, ut pondus inveniatur ſeipſo ponderoſius, vel vis elaſtica ſeipſa fortior, quod eſt abſurdum.*

No body now a-days that underſtands any thing of Nature and Philoſophy, can ſo much as imagine that any Animal, how abject ſoever, can be produced by Mechaniſm, without any active immaterial Cauſe; we all know there is nothing in the animal Machine but an Infinity of branching and winding Canals, filled with Liquors of different Natures, going the ſame perpetual Round, which are no more capable of producing the wonderful Fabrick of another Animal, than a Thing is of making itſelf. Beſides, in the Generation of an Animal, there is a Neceſſity that the Head, Heart, Nerves, Veins and Arteries, ſhould be formed at the ſame Time; which can never be done by the Motion of any Fluid, what way ſoever moved: For the Heart cannot move, unleſs animal Spirits be ſent from the Head thro' the Nerves into it. The animal Spirits cannot be derived into the Heart, unleſs the Blood be ſqueez'd by the Heart through

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the Arteries into the Brain; so that it is evident that the Head and Heart, the Arteries, Veins and Nerves, must all be formed at the same Time, and not successively, if the Animal is mechanically produced. But this is altogether impossible; for no Motion of any Fluid or Fluids, howsoever disposed, can form all these at the same instant; and we know all the internal mechanical Actions of Animals are performed by the Force of their circulating Fluids. From these and such like Considerations, it is evident that an Animal cannot be produced mechanically. This is too hard a Problem to be solved from so few *Data* as Matter and Motion, and it is doing Penance to read the wretched Accounts of the wisest and most learned Physicians and Philosophers on this Head: Read but *Des Cartes*, who by a bold, not to say impious Attempt, was the first since *Prometheus* and *Democritus*'s Days, who endeavoured to make an Animal; I say, read but *Des Cartes*, and you'll see how in every Step he contradicts the known Laws of Motion: And indeed the Manner after which he will have them generated, is as much above the Power and beyond the Laws of Mechanism, as the true and genuine Manner and Method of their Production is. Seeing then that the

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Formation of Animals does not depend on Mechaniſm, but on the powerful Influence and Operation of ſome immaterial Cauſe, whether of GOD Himſelf, the Soul of the Animal, or of ſome other ſubordinate Being, ſome vital Principle, plaſtick Power, or *Archæus*, concerns not the preſent Queſtion: I ſay, ſeeing that Animals are not at firſt produced by Mechaniſm, but by ſome active immaterial Cauſe; why, after that, ſo great Concern ſhould be ſhewn to reduce all to mere Mechaniſm, and to exclude an intelligent and active Principle from having any Share in the Government of thoſe Motions on which Life depends; and why it ſhould be thought that theſe Motions ſhould never ſtand in Need of new Impreſſions from ſome ſuch vital Principle as firſt ſet them a-going, I cannot ſo eaſily conceive.

If it ſhould be ſaid, that theſe Motions do not depend on Mechaniſm alone, but on Mechaniſm join'd with certain active Powers or Forces, imprinted by the Author of Nature upon all the Bodies of this Univerſe, ſuch as are the Powers of Attraction and Repulſion, by which indeed the greateſt part of the Phænomena of Nature are unqueſtionably produced; it is incumbent on thoſe who entertain this Opinion, to explain particularly how theſe Motions are

thus

thus continued by these active Principles before they can expect we should believe them. Could one single Instance be brought of any Motion that goes on perpetually in this Manner, without standing in Need of new Impressions from any active and intelligent Cause, there might be some more Pretence for this Hypothesis; but as no such Instance is to be found, I see no Necessity of having Recourse to such a Supposition for explaining the vital and natural Motions.

Is it not certain that these Motions are powerfully influenced by the Passions of Fear, Grief, Joy, Rage, *&c.*? And does not this clearly shew their Dependence on the Mind? The learned Dr. *Cheyne* (on the *English Malady*, *p.* 307.) gives the Case of Colonel *Townshend*, who for some Time before his Death could at pleasure suppress all the vital Motions, so as in all Respects to appear dead, and yet by an Effort or some how, he could come to Life again and restore these Motions. The Case is indeed singular, but not at all to be accounted for, without allowing the Mind to preside over the vital Motions. But this is not all; for in some Creatures, the Motion of the Heart has been found so irregular, as to give Cause for esteeming it altogether arbi-

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trary in the common Acceptation of the Word. There is a remarkable Inſtance of this recorded by *Liſter*, which I ſhall ſet down in the Author's own Words. *Denique* (ſays he, ſpeaking of the *Cochlea*) *cor nudatum, & oculis, ut hac ſectione fit, planè objectum, modo ſponte ad aliquam multa momenta, imo quadrantem horæ, pulſare deſiit; iterumque ſponte ſe ſtrenuè, & celeriter movebat. Ut certiſſimum ſit, cordis motum, in id genus animalibus, etiam voluntarium eſſe, & non merè naturalem, ut in homine reliquiſque ſanguineis animalibus; ſed pro earum lubitu ad quodvis tempus ſiſti, aut moveri poſſe*, &c. See *Liſter de cochleis & limacibus*, *p.* 38.

All theſe Things being conſidered, it ſeems probable to me that the Mind does not only preſide over thoſe Motions commonly called *voluntary*, but that it is alſo conſtantly employed in the Government of all the *vital* and *natural* Motions, which of themſelves would ſoon ſtop, were it not for the Influence and Interpoſition of this active Principle. It ſeems to me further, that theſe Motions in the Beginning of Life are altogether arbitrary, in the common Acceptation of the Word, and that it is only from Uſe and Cuſtom that they have become ſo neceſſary as to make it impoſſible

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for us, by any Effort of Mind, to hinder them from going on in their uſual Manner. The above-mentioned Caſe of Colonel *Townſhend* ſeems unexplicable on any other Hypotheſis; but when this is once granted, it admits of a moſt eaſy Solution, it being no more difficult to conceive how by repeated Endeavours we ſhould get the better of that Neceſſity, whereby the Heart moves, according to the Laws the Mind has originally impoſed on it ſelf, than it is to conceive how the Mind can get the better of that Neceſſity, whereby our Eyes are mov'd uniformly. It is indeed no eaſy Matter to ſquint, after that the uniform Motions of our Eyes have once been eſtabliſhed by Habit and Cuſtom, yet we are taught by Experience that the Thing is not altogether impoſſible; and ſeeing the Neceſſity whereby the *vital Motions* go on in a conſtant uniform Manner is of the ſame kind with that Neceſſity whereby our Eyes continue their uniform Motion, if the Mind can get the better of the one, I ſee no Reaſon why it may not alſo ſometimes get the better of the other, and for a Time ſuppreſs all thoſe Motions on which Life depends: Nor is it more ſurprizing that none of us are now able, by any Act of Volition, to retard, accelerate, or put a Stop

to

to the vital Motions, than it is that we cannot now give our Eyes different Motions, nor move our Eyes up or down, without at the ſame time moving our Eye-lids.

It is a common Obſervation, that the *Fœtus* in the Mother's Womb paſſes almoſt its whole Time in an unactive ſleepy State; and even Infants newly come into the World are ſeldom awake but when either Hunger calls for the Teat, or ſome Pain (the moſt importunate of all Senſations) or ſome other violent Impreſſion on the Body, forces the Mind to perceive and attend to it: And if we follow a Child from its Birth, and obſerve the Alterations that Time makes, we ſhall find that it comes to be more and more awake, thinks more and more of external Objects, and at laſt begins to know the Objects, which, being moſt familiar with it, have made laſting Impreſſions. If all this be duly conſidered, perhaps ſome Reaſon may be found for imagining, that in the Beginning of Life the Soul is wholly taken up in regulating and governing the internal Motions, which are yet difficult, by reaſon it has not been much accuſtomed to them; and therefore do require a cloſe and conſtant Application of Mind, which draws off its Attention from Things external, whence the Child muſt

appear to be in an unactive sleepy State: But as these Motions grow easier, the Mind by Degrees attends more and more to external Objects, seems less and less sleepy and unactive, till by Use and Custom these Motions do in time become so easy as to be performed without our Knowledge or Attention, and that so necessarily as to make it impossible for us, by any Act of the Mind, to hinder them from going on in their usual Manner; and then the Mind being at full Liberty to employ all its Thoughts about other Matters, the Creature appears no longer sleepy and unactive.

It were easy to illustrate and confirm this Doctrine by many familiar Examples; observe but Children when they first begin to walk, and you'll find that the whole Mind is employed in conducting the Motions necessary for their Progression, insomuch that if any thing shall divide the Mind, and draw off its Attention, they presently tumble down, by reason of the Difficulty that attends the Government of these Motions, which cannot be rightly conducted, while the Mind gives Attention to any thing else; but when Use and Custom have once made these Motions easy and familiar, then they need but little Attention, and allow the Mind to employ its most serious and anxi-

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ous Thoughts about other Matters. And what has been ſaid of walking, is in ſome meaſure alſo true of ſpeaking, ſinging, playing on muſical Inſtruments, and many other Exerciſes, whoſe Difficulty is only overcome by Habit and Cuſtom. Seeing then that there are many Actions that in the Beginning require ſo entire and undivided an Application of Mind, which nevertheleſs do in time become ſo eaſy as to need but little Attention, I ſee not why it may not now, after all that has been ſaid on this Subject, be allowed that the Soul in the Beginning of Life is wholly taken up in the Government of the internal Motions, which by Uſe and Cuſtom do in time become ſo eaſy as to be performed without our Knowledge or Attention, and that ſo neceſſarily as to make it impoſſible for us to hinder them from going on in their uſual manner. But I am wearied of this Subject, upon which I ſhould not have dwelt ſo long, had it not been that I underſtood that ſome were greatly ſurprized that I ſhould have ſuppoſed in the former Part of this Eſſay (*Med Eſſ. Vol.* III. *p.* 258.) that *the Mind may poſſibly preſide over the vital and natural as well as the animal Motions:* To take off which Surprize, and to ſhow that the Thing is at leaſt poſſible, I have been

obliged to enlarge beyond what I intended. Let us now proceed to the *final Cauſes* of this Change of Conformation in our Eyes.

It has already been ſhewn in general, that had the Eyes continued unvariably the ſame, there could have been no diſtinct Viſion, but at one determined Diſtance, either great, middle or ſmall, according to the particular Diſpoſition of Peoples Eyes: But that the ſeveral Phænomena, ariſing from this Defect in our Eyes, and the Benefits we receive from the Change that happens in their Conformation may be the better underſtood, it may not be improper that I ſhould here briefly explain the Phænomena that attend ſhort and long Sight, to which the Caſe before us is altogether ſimilar and analogous; this only excepted, that in the *Myopia* and *Viſus ſenilis* there is always ſome Latitude of Sight; whereas did not the Cryſtalline change its Situation, diſtinct Viſion would be confined to one determined Diſtance, and with reſpect to Objects at a greater or leſſer Diſtance, the Eye would be myopical or presbytical.

By *Myopes*, or People that are ſhort-ſighted, I do not mean ſuch as have a ſmall *Pupil* or *turbid Humours*, who on that Account are alſo ſhort-ſighted, by reaſon that a ſufficient Quantity of Rays do not paſs

paſs to the *Retina*, unleſs when the Object is near; nor do I mean ſuch as have a weakneſs of Sight, proceding from a certain Degree of Calloſity, Paralyſis, or Inſenſibility in the *Retina*, by which the Viſion is very faint and obſcure, unleſs when the Object is very bright and luminous, or when, becauſe of its Proximity to the Eye, it ſends a greater Number of Rays to the *Retina*: But by *Myopes* I underſtand, ſuch as have the *Cornea* and *Cryſtalline*, or either of them too convex, or that have the Diſtance betwixt the *Retina* and *Cryſtalline* too great. From this Diſpoſition of the Eye it is plain that

1*mo*, The diſtinct Picture of Objects at an ordinary Diſtance will fall before the *Retina*, and therefore the Picture muſt be confuſed on the *Retina* itſelf; from which Confuſion in the Picture, the Viſion will alſo be confuſed and undiſtinct. Whence

2*do*, In order to ſee diſtinctly, they are obliged to bring the Object very nigh to their Eyes; by which means the Rays that are now more diverging are made to converge and meet at the *Retina*, where a diſtinct Picture will be made, from which the Object will be diſtinctly ſeen.

3*tio*, They that are ſhort-ſighted never look attentively to thoſe that ſpeak to

them; for by reason of this Defect in their Sight, they cannot exactly observe the Motion of the Eyes of those that speak, which contributes greatly to explain their Thoughts, and augment the Force of their Words; and therefore they are only attentive to their Discourse, without fixing their Eyes on any Object. *Pliny* calls those who have big and prominent Eyes *Hebetiores*; but it is not to be supposed that this bigness in their Eyes can any way impare their Genius, or lessen their Vivacity: But as those who have such Eyes are commonly short-sighted, they do not look attentively to those that speak to them, whence they may be thought to be more dull and stupid than others; for we commonly judge of Peoples Attention from the Disposition of their Eyes.

4to, Short-sighted Persons need less Light for seeing clearly than others, and can easily read the smallest Print at the Light of the Moon, or in the Twilight, when such as have good Eyes are not able to distinguish one Letter from another: The Reason of this is plain; for when the Object is near, more Light enters the Pupil, and acts more powerfully upon the *Retina* than when it is at a greater Distance; but they who are short-sighted must, in order to see distinct-

distinctly, bring the Object near to their Eyes: Whence the Impressions made on the *Retina* by the Rays of Light, and the Vision that is caused thereby will be stronger than in those who cannot see distinctly but at a greater Distance. But besides this, in the *Myopia* the Pupil is very large, on which Account also more Light will enter the Eye, for rendring the Sight clear. That the Pupil is large in myopical Eyes, is a common Observation; nor will the Reason thereof be difficult to any one who shall consider that, 1*st*, The natural State of the Pupil is a State of Dilatation, as is manifest from its being very large in Faintings, and upon first waking, as also after Death. 2*dly*, The Cause of the Contraction of the Pupil lies in the Mind, which wills the Contraction of its orbicular Fibres, either when the Light is too strong, or when the Picture is not distinct upon the *Retina*. 3*dly*, When the Sight is perfect, that is, when it is neither too strong or too weak; and more especially when the Sight is weak, as in old Men, all Objects that are very near the Eyes will appear confused; on which Account, as well as on Account of the Quantity of Light that enters the Eye, the Pupil will be contracted: Whereas in short-sighted People, near Objects appear distinct,

and therefore the Pupil does only contract, by reason of the too great Quantity of Light that enters the Eye, which also they can easily avoid, by retiring into a darker Place, as every body commonly does, when the Light is too strong: And this is one Reason why the Pupil, which in Children is very large, does always continue so in those who are short-sighted, and who are not obliged to contract it for seeing more distinctly. But in the *Visus perfectus*, and especially in the *Visus senilis*, the Pupil must become smaller and smaller by Degrees; for by reason of its frequent Contraction for seeing near Objects more distinctly, the orbicular Fibres shrink, and become shorter; by which means the Pupil becomes narrower, just as the Fingers of Work-people are much bended from the frequent Contractions of the *flexores digitorum*.

5to, *Myopes* have their Sight mended by a concave Lens of a due Degree of Concavity; for the Refraction being here too strong, in proportion to the Distance of the *Retina* from the Crystalline, this Refraction will be diminished by the Interposition of such a Glass, and the distinct Image of the Object will be made to fall upon the *Retina*: But as such Glasses represent Objects

jects under a leſs Angle, they muſt appear leſs than to the naked Eye; which is what ſurpriſeth the moſt ſuch as are ſhort-ſighted, and who for want of Knowledge in Opticks are prepoſſeſſed with the Opinion, that Objects are always beſt ſeen when they appear largeſt.

6to, Their Sight will alſo be mended, by looking through a ſmall Hole, ſuch as that made by a Pin in a Card; for the little luminous Pencils, which have for their Apex a Point in the Object, and for their Baſis the little Hole, will, by reaſon of their Acuteneſs proceding from the Smallneſs of the Hole, take up ſo ſmall a Space on the *Retina* as to occaſion but little Confuſion in the Picture; whereas, without the Interpoſition of the perforated Card, the luminous Pencils will have a Baſe as large as the Pupil itſelf, and conſequently muſt occupy a much larger Space upon the *Retina*, from which the Picture, and the Viſion thereby occaſioned, will be a great deal more confuſed than when the Object is viewed thro' the ſmall Hole. And this is the Reaſon why ſhort-ſighted People, to ſee diſtant Objects more diſtinctly, call to Aſſiſtance their Eye-lids, which they ſhut ſo as to leave open only a very ſmall Slit, by which the Confuſion in the Picture is in ſome meaſure

ſure corrected, and the Sight is made more diſtinct, tho' leſs clear.

7mo, Short-ſighted Perſons commonly become leſs ſo, as they advance in Years, and that becauſe the Humours of the Eye do daily waſte and decay; from which Decay in the Humours, the *Cornea* ſhrinks, and becomes leſs convex, and the Cryſtalline becomes flatter than before, by which means the Rays of Light will be leſs refracted, and will not meet ſo ſoon behind the Cryſtalline; and therefore the Image on the *Retina*, and the Viſion cauſed thereby, will be more perfect and diſtinct, and the Eye will be enabled to ſee at a greater Diſtance, than when the Refraction was ſtronger in the more plump and convex Eyes: Whence we may ſee, why very young Children never take notice of any Thing but what is cloſe upon their Eyes; for in them the *Cornea* is too convex and prominent, to allow them to ſee diſtinctly, or attend to Objects at an ordinary Diſtance. This has been taken notice of by *Des Cartes*; and skilful Painters ſeem to be well acquainted with it, who therefore, when they paint young Children in Profile, give the *Cornea* an uncommon Convexity.

8vo, Small lucid Bodies, when at a conſiderable Diſtance, appear great, round, and

and frequently full of Spots. For underſtanding this, let H (*Fig.* 10.) be the Eye, and let the Candle A be the Object, which is here ſuppoſed to be at the Diſtance of about ſixty Feet, and which by reaſon of its Diſtance may be conceived as a Point. The Rays of Light AB, AC, &c. will, after Refraction in this *Myopical* Eye, converge and meet in a Point before the *Retina* as at o, and after that they will diverge and form on the *Retina* the large Image *de*, which will have the ſame Figure with the Pupil, and conſequently will be round. From the extreme Points of this Image *d* and *e*, draw through the Center of the Eye L, the right Lines *d*LD, *e*LE: Theſe Lines will be perpendicular to the *Retina*, at the Points *d* and *e*; and conſequently the Object A will, by means of its luxuriant Picture on the *Retina de*, be ſeen under the Angle DLE. If therefore about the Center A, with the Radius AD or AE, the Circle ADE be deſcribed, the ſmall Object A will be ſeen uniformly extended over all that Circle, and conſequently muſt appear big and round.

Whence they that are skilled in Opticks will eaſily ſee that, 1*ſt*, When the ſmall Object A is at a very great Diſtance, the Appearance will alſo be very great. At ſixty Feet diſtance, a Candle commonly appears a luminous

luminous Circle of about a Foot Diameter; but this will be greater or ſmaller, according to the Degree of Shortneſs of Sight, and Magnitude of the Pupil.

2*dly*, The nearer the Object is, the Appearance will be the leſs, and will approach the nearer to the natural Figure of the Object.

3*dly*, When two or more Candles of unequal Magnitude are ſeen at a great Diſtance, they will appear equal, and if they are not far from one another, their circular Appearances will cut each other; thus a Luſtre full of Candles puts on the Appearance of a Globe of Fire.

4*thly*, If the Hand be gently brought before the Eye, before that any one of theſe circular Appearances are hid, ſome Part of each Circle will be made to diſappear; and this Part that is made to diſappear will ly on the ſame Side with the interpoſed Hand; whereas in the *Viſus ſenilis* it lies on the oppoſite Side, as will be ſhewn below.

5*thly*, From this alſo it is eaſy to underſtand, why to all of us the Stars appear larger than they ought; for the Eye with reſpect to them being purblind, they are ſeen under a greater Angle, and conſequently muſt appear greater, for the ſame Reaſon that a diſtant Candle appears ſo to a

Myops:

Myops: Whence it is, that when the fixed Stars are viewed through a small Hole made in a Card, they seem much less than when seen with the naked Eye; for the Luxuriancy of the Image being in some measure corrected by the Smallness of the Hole in the Card, the Stars themselves must necessarily appear smaller: And this also is one Reason why the Telescope, which increases the Magnitude of all other Objects, diminishes that of the Stars; for this optical Instrument does not here magnify so much by increasing the Angle under which they are seen, as it diminishes by uniting the Rays at the *Retina*, and by that means correcting the Luxuriancy of the Picture: Nor is it any solid Objection to this, That the Sun and Moon, with respect to the Distance of both which, no doubt the Eye is also myopical, do appear larger when seen with a Telescope than with the naked Eye; for it must be observed, that at a given Distance, the Luxuriancy in the Image, proceeding from the Rays not being accurately united at the *Retina*, is always the same, and is not augmented according to the Magnitude of the Object; and therefore, in large Bodies, such as the Sun and Moon, it bears but a very small Proportion to the true Magnitude of the Image, and consequently,

quently, when this Luxuriancy is cut off by the Teleſcope, it makes no ſenſible Detraction from the Magnitude that ariſes from the Augmentation of the viſual Angle. And of the ſame Kind with this Appearance of the Stars, is alſo the Appearance of a diſtant Candle, which in the Night-time ſeems larger than it ought to moſt Eyes; becauſe the Eye, with reſpect to its Diſtance, is ſomewhat purblind, and the Pupil being then much dilated, muſt greatly increaſe the Luxuriancy of the Picture: But if this ſame Candle be viewed in Day-light, or even if it be viewed by Night from a well lighted Room, or if a Flaſh of Lightning ſhould happen at the Time it is viewed, it will not appear much bigger than it ought, by reaſon of the Contraction of the Pupil, which corrects the Luxuriancy of its Picture on the *Retina*.

As for what concerns the Spots that are ſo frequently obſerved by myopical Eyes; theſe may procede from ſome little Extravaſations, varicous Swellings, or other Defects in the *Retina*, which, by intercepting the Rays, will occaſion a Defect in the Picture, and by Conſequence, a ſimilar and correſponding Defect or Spot in the Object. Theſe Spots commonly vaniſh, or at leaſt become leſs ſenſible, when the Object is brought

brought nearer the Eye, and within the Limits of diſtinct Viſion; for the Rays, which are now exactly united upon the *Retina*, by being more crowded, have their Force augmented; by which means, a ſenſible Impreſſion is made upon the *Retina* through theſe Extravaſations, which are too thin to intercept wholly theſe Impreſſions, unleſs when they are weak and faint: And this is the Reaſon why theſe Spots are always moſt ſenſible to thoſe who have a ſmall Pupil, and eſpecially to thoſe who are ſhort or long-ſighted: From which alſo we may ſee, why in a Presbytical Eye the Spots, which were formerly very ſenſible, become ſo faint, when the Object is viewed through a convex Glaſs of a due Degree of Convexity; for by means of this Glaſs more Rays are made to enter the Eye, which being united exactly at its Bottom, muſt ſtrike the *Retina* ſtrongly enough for to make a ſenſible Impreſſion through theſe Extravaſations, which will render the Spots ſo faint and obſcure, as to be ſcarce any more obſervable. And what has been ſaid with reſpect to theſe Spots, when occaſioned by ſmall Extravaſations, or other Defects in the *Retina* that intercept the Rays, will alſo hold, when they are occaſioned by a Calloſity, or any Degree of Paralyſis or Inſenſibility

ſenſibility in ſome Parts of the *Retina*, by which the Impulſe or Stroke received from the Rays is made leſs ſenſible.

But beſides theſe Defects in the *Retina*, there is yet another Cauſe which may give Occaſion to thoſe Spots both in the *Myopia* and *Viſus ſenilis*, and that is certain ſmall opaque Marks on the *Cornea* itſelf, or any where within the Eye, which, by intercepting ſome of the Rays, muſt occaſion a Defect in the Picture, from which Defect a kind of dark Spot will be ſeen in the Object. Thus in the Eye of a *Myops*, (*See Fig.* 10.) if there is any Opacity in the *Cornea*, or within the Eye, which intercepts the Rays *Bbe*, *Ccd*, and *VLa*, there will be a Defect in the Picture at *e*, *d* and *a*, from which alſo the external Appearance will be deficient at the correſponding Points E, D and A, where, by Conſequence, dark Spots will be ſeen: For it is here to be obſerved, that there is not one Point in the Picture that is formed by a Plurality of Rays which convene at that Point, but every Ray goes to a different Point of the Picture, both in myopical and presbyticall Eyes; and therefore, when any of the Rays are intercepted, that Part of the Picture to which ſuch Rays belong, will not be illuminated, which muſt occaſion a cor-

responding Defect in the Appearance of the Object; but in the *Visus perfectus*, where the Rays that come from the several Points of the Object are so refracted as to meet again at so many corresponding Points in the *Retina*, every Point of the Picture is formed by a Cone or Pencil of Rays, whose Basis is the Pupil; and therefore, though some of those Rays be intercepted, yet no Part of the Picture will be darkened, and consequently no Defect will be seen in the Object from any such Opacity in the *Cornea* or Humours of the Eye, unless this Opacity be in the back Part of the vitrous Humour, where the Pencil is narrow, and intercepts the whole Pencil.

If any desire an experimental Proof of this, let them repair to a *Camera obscura*; and having made some dark Spots in the *Lens*, by applying Patches, or any such like small opaque Bodies, let this Glass be placed at a round Hole made in the Window-shut of the dark Chamber for refracting the Light which comes from an Object without Doors, so as its Picture may be painted on a Sheet of white Paper, placed behind the *Lens*; if this Paper be at a due focal Distance from the *Lens*, no Defect or Spot will be found in the Picture; but if the Distance of the Paper be greater or smaller,

than that at which the Rays convene, for making the Picture distinct, as many dark Marks will be seen in the Picture as there are Spots in the Glass: And it is only from this Principle that any satisfactory Account can be given how it comes to pass, that when a small opaque Body, that is, a Body that is less than the Pupil, is held close to the Eye, before which several Candles are placed at a great Distance, suppose sixty Feet, if the Eye attend to this small Object, or, which is the same Thing, if it endeavour to accommodate itself to its Distance, this Object will be seen multiplied according to the Number of Candles, and will appear like a dark Spot in each of the Candles. This Phænomenon seems very extraordinary to such as have no Knowledge in Opticks; but from the Principles already established, it admits of a most easy Solution. For when the Eye endeavours to see the small Object, it becomes myopical with respect to the Candles; and therefore on each of their Pictures on the *Retina*, the dark Shade of the interposed Body will be cast; from which a corresponding dark Spot must be seen in each of the Candles: But when the Eye does not attend to this small Body, but is well disposed for seeing the Candles distinctly, this

interposed

interpoſed Body will not be multiplied, nor will any dark Mark be ſeen in any of the Candles, becauſe every Point of their Pictures is now compoſed of a Cone or Pencil of Rays, which after Refraction are made to convene at that Point; and therefore, tho' ſome of the Rays belonging to each Pencil are intercepted, yet every Point of the Picture will be ſufficiently, and indeed equally illuminated by the Rays that are not intercepted; and conſequently no Defect or Obſcurity will be ſeen in any Part of the Candles, and the ſmall opaque Body will itſelf ſeem perfectly diaphanous.

9*no*, Another Phænomenon belonging to *Myopes* is, that they read and write very ſmall Characters, by reaſon that the viſual Angle is enlarged by the Proximity of the Object: Whence alſo it is, that great Characters fatigue their Eyes, becaule of the Motion that is required to run over a Word.

10*mo*, In reading, they generally hold the Book towards the Side of their Head, that it may be ſufficiently illuminated and not darkned by the Shade of their Head.

11*mo*, No Object being diſtinctly ſeen but what is very nigh, in order to ſee it with both Eyes, their Axes muſt be very converging; which Situation of their Eyes

being painful and laborious, because of the strong Effort that must be exerted by the adducent Muscles, they are oftentimes obliged to turn away one of their Eyes; whence procedes a double Vision, which in reading, does frequently oblige them to shut one of their Eyes, that they may avoid the Confusion that is occasioned thereby.

12*mo*, There is yet another Phænomenon which happens to all Kinds of Sights, but it is commonly a great deal more sensible to those that are purblind than to others, because that in them the *Cornea* is more convex and elevated, *viz.* they see an Object that they do not look at, and they do not see this same Object when their Eyes are turned towards it. This seems a Paradox in Opticks, but it is agreeable to Experience; for having applied to the Side of the Head any thin black Body, such as the Brim of a Hat, so as it may abscond the Objects that are upon that Side: Without moving the Eye, turn the Head with the black Body that is fixed to its Side, till you shall perceive a certain small white Object placed upon a black or brown Ground; then keeping the Head fixed in this Situation, let the Eye be directed to the Object and it will vanish.

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This Experiment is apt to ſurpriſe at firſt, but it is very eaſy to account for it from the Conformation of the Eye; for if AIK (*Fig.* 11.) be the Eye, BL the black Body placed near to the Eye, and if O be the white Object, the Pupil *fc* being turned towards M: The Rays which come from the Object O, in paſſing by the black Body BL, will fall obliquely upon the *Cornea* at A, and will be refracted in the aqueous Humour, ſo as to paſs through the *Pupil fc*, and conſequently will fall upon ſome Part of the *Retina*; by which means the Object O will be ſeen, though the Eye is not directed to it: But if, without moving the Head, the Eye be turned towards O, it muſt move nearly upon its Centre H, from which the *Cornea* and *Pupil* will get the Poſition given them in the Figure; and therefore, though even in this Poſition of the Eye, the Rays that come from O, and that paſs over the Extremity of the Obſtacle at B, ſhould be ſuppoſed to fall upon the *Cornea*, yet by reaſon of the Obliquity of their Incidence, they can never be ſo refracted as to enter the Pupil ED, but muſt be all loſt upon the *Uvea*; from whence it is evident, that the Object O will not be ſeen when the Eye is directed to it.

I have done with the Short-ſight, and

shall now shortly explain the Phænomena that belong to the weak or presbytical Sight. *Presbytæ*, or weak-sighted People, are such as have the *Cornea* and Crystalline, or either of them, too flat, in Proportion to the Distance betwixt the *Crystalline* and *Retina*: From which Fault in the Conformation of their Eyes, it clearly follows, that,

1*mo*, The Rays of Light that come from the several Points of an Object at an ordinary Distance, will not be sufficiently refracted, and for want of sufficient Refraction will not meet at the *Retina*, but beyond it; and therefore the Picture on the *Retina*, and the Vision caused thereby will be imperfect and undistinct, more or less, as the Object is nearer or further off. Whence,

2*do*, In order to read, they must remove the Book to the Distance of two or three Feet, whereas in their Youth they used to read at one Foot distance. But,

3*tio*, As the Picture on the *Retina*, and the visual Angle under which the Object is seen are then lessened, and that in Proportion as the Distance of the Object is increased; it is evident that small Objects will not be seen well, even when their Distance is such as is necessary for making their Picture

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on the *Retina* diſtinct. Whence it is, that ſometimes they cannot read at all, eſpecially if the Characters be ſmall, without the Aſſiſtance of Spectacles; which are ſtill the more neceſſary, becauſe that when the Object is at a Diſtance, leſs Light enters the Eye, and conſequently the Picture, and the Impreſſion made on the *Retina* thereby will be fainter.

But for a fuller Explication of this Point, and to ſhow how ſmall Objects may become inviſible to the naked Eye, even when their Picture is diſtinct upon the *Retina*, it muſt be obſerved that there is a *minimum viſibile*, and that all Objects, however ſmall, if at all ſeen, are ſeen of that Bigneſs. For the *Retina* being compoſed of ſmall Fibres, not unlike a Piece of Pluſh, with the Ends of the Threads turned towards the Cryſtalline, all the other Ends of them being terminated in the Brain, there can be no more diſtinct Senſations than there are diſtinct Threads to convey the Impreſſion on them, and the Eye will be incapable of diſtinguiſhing the Parts of any Picture that is no bigger than one of theſe Fibres compoſing the *Retina*; ſo that if any Object be ſo far removed from the Eye, as to make the Picture of it on the *Retina* leſs than one ſingle Fibre, that

Object becomes inviſible, if it be but of a dull Radiation, becauſe of the Weakneſs of the Impreſſion made on the Fibre; but if it be of a very bright and powerful Radiation, the whole Filament is moved, by having one Part of it powerfully acted on, and therefore the Senſation is the ſame as if the Object were much bigger, and did take up or cover the whole End of the Filament: And this to me ſeems to be the Reaſon why the Stars appear all of the ſame bigneſs, and why even to the naked Eye they appear many thouſand times bigger than really they are, and even as big as through a long Teleſcope, which would not be, if our Sight were ſufficiently fine and nice. I have ſaid, that when an Object is ſo far removed from the Eye, as to make the Picture of it on the *Retina* leſs than one ſingle Fibre, that Object becomes inviſible, if it be of a dull Radiation, by Reaſon of the weakneſs of the Impreſſion: For the Strength of the Impreſſion, when the Picture covers the whole End of the Fibre will be to its Strength, when it only covers a Part of it, as the Magnitude of the whole Fibre is to the Magnitude of that Part of it that is taken up by the Picture.

But there is yet another Reaſon, why an Object is not ſeen, when its Picture is leſs than

than one ſingle Fibre, and that is, that this ſame Fibre does not only receive an Impreſſion from this Object, but it does alſo receive an Impreſſion from the extreme Parts of the contiguous Objects by which it is terminated; which, if they be of a bright Radiation, muſt prevail over the other Impreſſion, and, by their Prevalence, render the Object itſelf inviſible: Thus, if one of the Fibres compoſing the *Retina*, be ſuppoſed as big as *a*o, (*Fig.* 12.) the ſmall Objects IE will, on the *Retina*, make a Picture betwixt *i* and *e*, and the contiguous Objects OI and AE will on the ſame Fibre *a*o, form a Picture at o*i*, and *ae*, which being white, will act more powerfully on the Fibre *a*o, than does the Picture of the ſmall black Object IE, and conſequently this ſame Object IE muſt become inviſible, and the more bright and luminous Bodies OI and AE muſt appear extended over all the Space OIEA. The learned Dr. *Hook* by an eaſy Experiment found the *minimum viſibile* in moſt Eyes to be comprehended within an Angle of one Minute, (*See his poſthumous Works, p.* 12. *and* 97.) Whence it is, that whatever is ſeen, is ſeen of that Bigneſs, or under that Angle: Thus every Star that the Eye diſcovers appears to be of the Bigneſs of a Minute at leaſt,

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and so it is conceived really to be; though yet when we come to examine its Diameter by the Help of a Telescope, we really find it to be but some few Seconds, or 60 Parts of such an Angle: And this also is the Reason why, if there be two, three, or a hundred small Stars so near together, as that they are all comprised within the Angle of one Minute, the Eye has a Sensation of them all as if they were one Star, and distinguishes them not one from another; because all their Pictures, falling upon the same nervous Fibre, make but one Impression on the *Sensorium*; which being strong and powerful, prevails over, and destroys the more faint and languid Impression made by the Picture of the Interval that is betwixt them: And the Case is exactly the same when an old Man removes the Book to a very great Distance from his Eyes; for if the black Lines forming the Letters are seen under a less Angle than a Minute, they will be wholly obliterated by the more powerful Impressions of the white Paper that terminates them.

And here by the way it may not be improper to observe, that this Experiment of Dr. *Hook*'s, serving to determine the *minimum visibile*, affords us a pretty certain Proof of the Magnitude of our nervous Fibres

Fibres: For if *ao* (*Fig.* 12.) be the End of one ſingle Fibre, the ſmall Object IE, which is here ſuppoſed to be bright and luminous, will, by means of its Picture on the *Retina ie*, move the whole Fibre, and the Appearance of the Object will be the ſame as if its Picture were extended over the whole End of the Fibre *ao*; and therefore, if from the extreme Points of the Fibre *a* and o, the right Lines *ax*A, *ox*O are drawn thro' the Center of the Eye *x*, theſe Lines will be perpendicular to the *Retina* at the Points *a* and o, and conſequently the ſmall Object IE will be ſeen under the Angle O*x*A; which Angle being given, the Angle o*xa*, which is equal to it (both being Angles at the Vertex *x*) will alſo be known, from which the Diameter of the nervous Fibre *ao* may eaſily be found. Thus if the Angle O*x*A be one Minute, as Dr. *Hook* found it in moſt Eyes, though there were ſome that could ſee to the third of a Minute, the Angle o*xa* will alſo be one Minute, which is the 60th Part of a Degree, or the 21,600 Part of a Circle: Whence if the Eye be ſuppoſed to be one Inch Diameter, or three Inches in Circumference, the Diameter of the nervous Fibre *ao* will be the 21,600 Part of three Inches, or the 7200 Part of one Inch, which is the 600 Part of a Line; and if ten Hair-breadths

make

make a Line, which is pretty near the Truth, its Diameter will not exceed the 60 Part of the Diameter of a Hair: Whence the nervous Fibres themselves will be no bigger than the 3600 Part of an ordinary Hair. And if it be supposed that one can see under an Angle that is no bigger than the third of a Minute, as Dr. *Hook* found that some could do, then the bigness of the nervous Fibres composing the *Retina* will not exceed the 32,400 Part of an ordinary Hair, which is a surprising and almost inconceivable Smallness; and the more, because each of these Fibres are supposed hollow Canals or Tubes in which the Spirits flow. How fine and subtile must then the Spirits themselves be? But this is not all; for if Birds can see distant Objects as well as Man, which seems very probable, because of the Facility which they have, in returning to Places at a great Distance from which they had gone, and especially because Birds of Prey are observed to perceive very small Animals at a great Distance; I say, supposing that Birds see Objects at a Distance as well as we do, it is necessary that the Fibres which compose their optick Nerves and *Retina*, be much more fine and delicate than in Men; for since their Eyes are smaller than ours, the Image of Objects

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on the *Retina* will alſo be ſmaller: Whence it is manifeſt, that a ſimilar Conformation of the Humours is not alone ſufficient to make an equal Perfection in the Sight: For Inſtance, an Eye of two Lines Diameter, (than which there are many ſmaller) which has the Humours of a ſimilar or like Figure to thoſe of a human Eye, whoſe Diameter is an Inch, can never ſee Objects at a great Diſtance as diſtinctly as we do, unleſs the Organ of Sight on which the Pictures of Objects are received, be 36 times finer and more ſenſible than it is in our Eyes: For the Picture of the Object will be 36 times ſmaller in their ſmall Eye than in ours, the Surfaces of the Globes of their Eyes being to one another as 1 is to 36. And therefore, if the nervous Fibres of our *Retina* do not exceed the 32,400 Part of a Hair, in Animals, whoſe Eyes are only two Lines Diameter, they will be no bigger than the 1,166,400 Part of an ordinary Hair, which is truly a prodigiouſly ſurpriſing and almoſt incredible Smallneſs; and yet upon Calculation, it is as certain as any Propoſition in *Euclid*, that they can be no bigger, if we allow them to ſee Objects at a Diſtance as diſtinctly as Men do. But I muſt go forward.

4to, They who are long-ſighted require more

more light than others for enabling them to read; for being obliged to remove the Book to a considerable Distance, that the Rays which come from the several Points of the Object may meet again in so many correspondent Points on the *Retina*, without which there can be no distinct Vision, less Light will enter the Eye, and the Impression made thereby on the *Retina* will be too faint, unless the Object be more strongly illuminated, than what is necessary either in the short or perfect Sight; in both which, the Proximity of the Object does in some measure recompense its Obscurity. Add to this, that in the presbytical Eye the Pupil is always smaller, on which Account also more Light will be required for making a sufficient Impression on the *Retina*. And this is the Reason why,

5to, The presbytical Eye receives greater Benefit from the Use of a convex Lens, than the Eye of a Myops does from one that is concave: For the Property of such Glasses being to collect the Rays, more of them will be made to enter the Pupil; and as in such Eyes the Refraction is too weak, the Rays which flow from a Point at an ordinary Distance, and which, for want of sufficient Refraction, do not concur at the *Retina*, but at some Place beyond it, will

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by means of this Glaſs be made to meet at the *Retina:* Whence they that are long-ſighted muſt receive a double Advantage from convex Glaſſes; for by them the Picture is not only diſtinct upon the *Retina*, but is alſo as ſtrong and lively as if the Pupil had been much larger.

6to, Long-ſighted People ſee more diſtinctly through a ſmall Hole, ſuch as that made by a Pin in a Card; for by this Hole the Picture will be rendred more diſtinct upon the *Retina*, and that for the ſame Reaſon that has been given, why in a *Myops* the Sight is mended, by looking thro' a ſmall Hole: But as Part of the Light is intercepted by the Card, and as long-ſighted People require more Light than others for rendring their Sight equally clear, they will not reap ſo much Advantage from the Interpoſition of the perforated Card as thoſe who are ſhort-ſighted, and who by reaſon of the Proximity of the Object can eaſily read in the Twilight, when ſuch as have not that Defect in their Eyes, cannot diſtinguiſh one Letter from another.

7mo, They who are long-ſighted commonly become more ſo as they advance in Years; for the *Cornea* and *Cryſtalline* become flatter and flatter continually, becauſe of the daily Waſte and Decay that happens in the

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Humours of the Eye; whence at last they cannot see at all, without the Assistance of Spectacles, which supply the Refraction that is wanting in the Eye, by rendring the Rays converging, which can never be done by the alone Position of the Object from which they proceed: For if it is near, they enter the Eye diverging; and if it is far off, they enter nearly parallel. But though the presbytical Eye does commonly become more and more so by Degrees; yet some have been found who at last recover their Sight again, and have no further Occasion for their Glasses to enable them to read. There are many Causes which may produce this Effect, but to me it seems probable that it should chiefly arise from a Decay of the Fat in the Bottom of the Orbit; whence the Eye, for want of the usual Pressure at its Fund, is by the Pressure of the Muscles and Fat towards the Sides of the Eye, reduced to an oblong Figure, by which the *Retina* is removed to a due focal Distance from the *Crystalline*. From this it is easy to see, how, from a contrary Cause, the Sight, which was perfect till about the 20th or 25th Year of their Age, does in some for a certain Time after that become more and more myopical by Degrees: For if at this Time the Muscles of the Eye become bigger

bigger and more fleshy than before, or if the Fat should be collected in greater Plenty towards the Side of the Eye, the Eye will, by reason of the Pressure on its Sides, be reduced to an oblong Figure, and the *Retina* will be pushed back to too great a Distance from the Crystalline, which obliges them to bring the Object they would see distinctly nearer to their Eyes, that its Picture may be distinct upon the *Retina*; whereas, before that, they used to read at an ordinary Distance.

8*vo*, In the presbytical or weak Sight, as well as in that which is perfect, the Eye is more sensibly affected, and suffers more by great Light than when the Sight is myopical with the same opening of the Pupil; for the luminous Bodies that surround us, and which are not very near us, send Rays into the Eye, which in the *Visus perfectus* are brought together, and united upon the *Retina*, and make but a very small Base in the presbytical Eye; whence the Impression made on the *Retina* will be strong and lively in both these Eyes, and must therein cause some Pain or Uneasiness, which does not happen in the myopical Sight, because these same Rays make a larger Base on the *Retina*; for all things being equal, the myopical Eye always sees Objects more confusedly than

does either the perfect or presbytical Eye, and this Confuſion is cauſed by the Space which the Rays that come from each Point of the Object occupy on the Fund of the Eye. And this by the By is another Reaſon why the Pupil, which in Children is very large, continues more ſo in thoſe who are ſhort-ſighted than in thoſe whoſe Sight is either perfect or weak, and who by reaſon of the too ſtrong Impreſſion made upon the *Retina*, by bright and luminous Objects are obliged to contract the Pupil, for keeping out a Part of the Light.

9no, To a presbytical Eye, ſmall lucid Objects, ſuch as a lighted Candle, or a ſmall Hole of a Line or two Diameter, which is luminous, becauſe of the Light which paſſes it, appear big and round; and if the Rays on either Side of the Pupil be intercepted by the Interpoſition of any opaque Body, the oppoſite Side of the Appearance will be hid, and the opaque Body itſelf will appear as if it were on the contrary Side to that where it really is.

This Phænomenon will, no doubt, ſeem very extraordinary to ſome; for ſince we always judge that Objects are in a contrary Poſition to that of their Pictures on the *Retina*, in the preſent Caſe it would ſeem that the Order of Nature is inverted; for by

by this Experiment we ought to conclude, that the Object forms its Picture on that Side of the *Retina* on which it is, which is altogether contrary to all the Laws of Opticks, and to all our other Experiences.

For explaining this Phænomenon, ſee *Fig.* 13. where the Candle A is the ſmall luminous Object, BC*de* the Eye, and *a* the Point of Concourſe, where the Rays AB, AC, *&c.* that come from the Point A, are united behind the *Retina*; theſe Rays being cut by the *Retina* before their Reunion, will thereon form the large Image *ed*, which by Reaſon of the round Figure of the Pupil will alſo be round, whence the Candle it ſelf will likewiſe appear round, and of a Bigneſs anſwerable to the Bigneſs of its luxuriant Image; for by means of the Impreſſion at *e*, it will be ſeen at E in the right Line *ex*E, which being drawn through the Center of the Eye *x*, is perpendicular to the *Retina* at the Point *e*, and by means of the Impreſſion at *d*, it will be ſeen at D in the right Line *dx*D; which being drawn through the Center of the Eye *x*, is alſo perpendicular to the *Retina* at the Point *d*, and by means of the other Impreſſions made by the other Rays forming the circular Picture *ed*, it will be ſeen in the other Points of the Circle AED deſcribed

about the Center A, with the Radius AD or AE, and consequently will appear big and round: And if by the Interposition of the opaque Body F, the Ray AC be intercepted, there will be a Defect in the Picture at *d*, and consequently a similar Defect in the Appearance at D; and therefore if this same Body F be slowly mov'd from C to *f*, this Defect in the Picture will, by Degrees, extend itself from *d* to o, by which a similar Defect in the Appearance will be made to extend itself from D to A, insomuch, that when the Extremity of the opaque Body F has, by moving from C to *f*, come to *f*, the half of the Picture at *do*, and the corresponding half of the Appearance DA will be made to vanish, and the Candle will get a semicircular Appearance at AE: Whence it is easy to see, that the opaque Body itself F must appear as if it were on the contrary Side to that where it really is; for being moved from C to *f*, it will have the Appearance of a dark Shade that is moved from D to A.

10*mo*, The last Phænomenon that I shall notice, is the little Spots or Marks that long-sighted People are so liable to see before their Eyes. I have already enquired into the Cause of these Spots, and have shown that when the Eye sees distinctly, no Spots will

will appear, unleſs there be ſome Defect in the *Retina* itſelf: But both in the *Viſus ſenilis* and *Myopia*, certain dark Spots or Marks will alſo be ſeen, when there are any ſmall opaque Marks on the *Cornea*, or any where within the Eye, that intercept ſome of the Rays in their Paſſage to the *Retina*; whence ſuch Eyes may be ſaid to ſee all their own Defects, which does not commonly happen when the Eye ſees diſtinctly, becauſe then the Rays that come from a Point in the Object are exactly united in a correſponding Point in the *Retina*; and therefore though ſome of them be intercepted, yet that Point will be ſeen by means of thoſe that paſs; yet if any ſuch opaque Spot be in the Back-part of the vitrous Humour where the Pencil is narrow, and intercept the whole Pencil, the correſponding Point of the Object will be darkned. Theſe Spots or Marks are not all of the ſame kind, there are ſome which may be called *fixt* and *permanent*, becauſe they do not change their Place with reſpect to the Axis of Viſion, and theſe muſt proceed from ſome Defect either in the *Retina* or *Cornea*, or in the *vitrous* and *cryſtalline* Humours. Others there are which may be called *fluctuating* and *inconſtant*, becauſe they are in conſtant Motion, and change

their Place continually; and theſe muſt a-riſe from ſome Corpuſcles floating in the a-queous Humour, which, being thin like Water, does not hinder them from chan-ging their Situation; but whether they are fixt or moving, they muſt always appear like dark Marks or Defects in the Object, and that as well when they proceed from opaque Spots on the *Cornea*, or any where within the Eye, as when they proceed from the above obſerved Defects in the *Retina* itſelf.

And this leads me to explain another kind of Spots that are very common in the presbytical Sight, and which are not dark and ſhady, like thoſe that have been alrea-dy accounted for, but more bright and lu-minous than the Object itſelf before which they appear. Theſe Spots appear beſt in looking to bright Objects at a conſiderable Diſtance, and are always of the ſame Co-lour with the Object before which they are ſeen. In the Middle their Colour is clear and ſtrong, which is ſurrounded by a dark and ſhady Border, not unlike the Knots on a poliſhed Fir-board. They are commonly accompanied with certain irregular Veins that proceed from each Spot, and which as well as the Spots themſelves, change their Order and Diſpoſition. Theſe Veins are al-

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ſo of the ſame Colour with the Object, and being bright and luminous in the Middle, are likewiſe terminated by a dark and obſcure Edge, as may be ſeen at *Fig.* 14. Theſe Spots and Veins do not always remain in the ſame Place, but change their Poſition with reſpect to the *Axis of Viſion*, according as the Eye is differently moved, being ſometimes in the *Axis of Viſion* itſelf, and at other times to the right or left of this ſame Axis; but when the Eye is kept fixt in the ſame Direction, they commonly deſcend gradually.

As for what concerns the Cauſe of theſe Spots and Veins, it ſeems evident that 1*mo*, They muſt proceed from ſome Corpuſcles within the Eye, which are at Liberty to change their Place, and which therefore muſt be ſuppoſed to float in the aqueous Humour. 2*do*, Seeing theſe Spots do always deſcend when the Eye is kept fixt and immoveable, the Corpuſcles from which they ariſe muſt aſcend, and conſequently are lighter than the aqueous Humour in which they ſwim. 3*tio*, Theſe Spots being more bright and luminous than the Object itſelf before which they are ſeen, they cannot be occaſioned by any opaque Corpuſcles, which by intercepting the Rays do caſt a Shade upon the *Retina*. For from

ſuch Corpuſcles the Spots would appear like Defects or dark Marks on the Object, as has been ſhown above. What therefore ſeems to bid faireſt for producing theſe Spots and Veins, is ſmall, oily, diaphanous Particles and Filaments, that ſwim in the aqueous Humour before the Cryſtalline; for ſuch Particles and Filaments, by reaſon of their Lightneſs, will mount upward, when they are left to themſelves, and are not diſturbed by the Motion of the Eye, and by their greater refractive Power, they will produce theſe luminous Spots and Veins, terminated by dark and ſhady Borders. That oily and ſulphureous Subſtances, though leſs denſe than Water, have a ſtronger refractive Power, is evident from the Obſervations of the incomparable *Newton*, who, in his admirable *Treatiſe of Opticks*, has given us an exact Table ſhewing the Refractions of almoſt all kinds of Bodies, by which it appears that the refractive Power of unctuous and ſulphureous Subſtances is two or three times greater, in reſpect of their Denſities, than the refractive Powers of Glaſs and other terreſtrial alkalizate Concrets; and that Rain-water, with which the aqueous Humour may be ſuppoſed to agree, has a refractive Power, in a middle Degree, between thoſe two ſorts of Subſtances. From

which

which it follows, that the Rays of Light which paſs through theſe oily Particles, ſuffer a much greater Refraction, and by conſequence will meet ſooner behind the *Cryſtalline*, than the Rays that paſs by and do not meet with ſuch Particles: Whence if the Conformation of the Eye be ſuch as renders it *presbytical*, the Rays of Light that come from the ſeveral Points of the Object will not converge to ſo many other Points in the *Retina*, but behind it, by which the Picture on the *Retina*, and the Viſion cauſed thereby, will be rendred more dark and obſcure; but the Rays which paſs through theſe oily Grains and Filaments, by having their Refraction increaſed, will be made to meet nearly at the *Retina*, where they will form ſmall luminous Spots and Veins, ſurrounded with dark and ſhady Borders; juſt as a convex Glaſs, when expoſed to the Sun, forms its luminous Focus in the Middle of a very ſtrong Shade with which it is environed. For as Light is not generated when ever we ſee it encreaſed, it is by robbing ſome other Part of its Light, or by bringing the Light that ſhould have been diffuſed over ſome other Part to the more enlightned Place. When therefore the Rays of Light that paſs through theſe oily Particles and Veins are

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ſo refracted as to convene at the *Retina*, and paint thereon ſmall luminous Spots and Veins, theſe Spots and Veins will be terminated by a dark and a ſhady Edge, becauſe the Light which ſhould have illuminated the Edge is now made to fall on the luminous Picture: And this you ſee, how in the *presbytical Eye*, ſmall luminous Spots and Veins, encompaſſed with dark and ſhady Borders, may be painted on the *Retina*, and how from ſuch Pictures, ſimilar and like Spots and Veins will be ſeen moving before the Object.

From what has been now ſaid concerning the Phænomena that are peculiar to the *ſhort* and *long-ſight*, it is eaſy to deduce the many Advantages that accrue to us from the Motion of the *Cryſtalline Humour*; for it being by the Motion of this Humour that our Eyes are fitted for ſeeing diſtinctly at different Diſtances, had we been denied the Power of changing its Situation, there could have been no diſtinct Viſion, but at one determined Diſtance, either great, middle, or ſmall, according to the particular Diſpoſition of our Eyes; and with reſpect to all Objects at a greater or leſſer Diſtance, the Sight would have been *myopical* or *presbytical*, and conſequently would have been liable to all the Symptoms

ptoms, Defects and Inconveniencies above explained. But,

2*do*, Beſides the Advantage we receive from the Mobility of the *Cryſtalline*, in enabling us to ſee diſtinctly at different Diſtances, there is yet another taken Notice of by the greateſt Part of our optical Writers, which conſiſts in enabling us to judge with more Certainty of the Diſtance of Objects.

There are ſix Things whereby we are enabled to diſcover the Diſtance of Objects, all which I have promiſed to explain, in order that it may thence appear, that when with one Eye, the other being ſhut, an Object is viewed through ſmall Holes made in a Card, we can ſcarce form any Judgment with reſpect to its Diſtance, but what is founded on Prejudice and Anticipation, as has been affirmed above.

The *firſt Mean* whereby the Mind judgeth of Diſtance, conſiſts in that Diſpoſition of the Eye that is neceſſary for ſeeing diſtinctly at different Diſtances. We have already demonſtrated, that there can be no diſtinct Viſion, unleſs the Rays of Light, which are ſent from the ſeveral Points of the Object, be, by the Humours of the Eye, refracted and brought together in ſo many correſponding Points on the *Retina*; and

and that the ſame Conformation in the Eye is not able to perform this Effect, but muſt be changed by the Contraction of the *Ligamentum ciliare*, which being ſenſible to us, becauſe it depends upon our Mind which regulates it, will enable us in ſome meaſure to judge of Diſtances even with one Eye; as for Inſtance, when I view an Object at ſeven Inches diſtance, I diſtinguiſh its Diſtance by the Diſpoſition of the Eye, which at that Diſtance is not only ſenſible, but in ſome ſort uneaſy: And when the ſame Object is viewed at twenty ſeven Inches diſtance, the Diſtance is ſtill perceived, becauſe the neceſſary Diſpoſition of the Eye is ſtill ſenſible, though no longer uneaſy. And thus you ſee how, with one Eye alone, we judge of leſſer Diſtances from the Change which happens in the Conformation of the Eye; but as this Change in the Conformation of the Eye has its Limits beyond which it cannot go, it can be of no Uſe in aſſiſting us to judge of the Diſtance of Objects placed without the Limits of *diſtinct Viſion*, which in my Eyes reach no further than from ſeven to twenty ſeven Inches: But as the Object does then appear more or leſs confuſed, according as it is more or leſs removed from theſe Limits, this Confuſion ſupplies the

Place

Place of the Motion of the Cryſtalline, in aiding the Mind to judge of the Diſtance of the Object, it being always eſteemed ſo much the nearer or further off, by how much the Confuſion is greater; but this Confuſion has its Limits alſo, beyond which it can never extend: For when an Object is placed at a certain Diſtance from the Eye, to which the Breadth of the Pupil bears no ſenſible Proportion, the Rays of Light that come from a Point in the Object, and paſs the Pupil, are ſo little diverging, that they may in a phyſical, though not mathematical Senſe, be looked on as parallel; and therefore the Picture on the *Retina* will not to Senſe become more confuſed, though the Object be removed to a much greater Diſtance. What this Diſtance is to which the Diameter of the Pupil bears no ſenſible Proportion, Authors are not agreed on, nor ſhall I at preſent take upon me to determine; but conſidering the Smalneſs of the Pupil, it is obvious that it cannot reach any far Way; and conſequently this Confuſion in the Appearance of Objects can only aſſiſt us in judging of ſmall Diſtances.

The *ſecond*, moſt univerſal, and frequently the moſt ſure *Mean* we have for judging of the Diſtance of Objects, is the Angle made

made by the *optick Axes* at that Part of the Object on which our Eyes are fixed: For our two Eyes are like two different Stations in *Longimetry*, by the Aſſiſtance of which, Diſtances are taken, as hath been explained in the former Part of this Eſſay. And this is the Reaſon why thoſe that are blind of one Eye do ſo frequently miſs their Mark in pouring Liquor into a Glaſs, ſnuffing a Candle, and ſuch other Actions as require that the Diſtance be exactly diſtinguiſhed; of which Mr. *Boyle* has given ſeveral Inſtances, in his Obſervations upon the vitiated Sight.

The *third Mean* for judging of the Diſtance of Objects, conſiſts in their apparent Magnitudes, or the Magnitude of their Image painted upon the *Retina*. The Diameter of theſe Images does always diminiſh in Proportion as the Diſtance of the Object they repreſent does increaſe; and therefore, from this Change in the Magnitude of the Image, we eaſily judge of the Diſtance of Objects, as often as we are otherwiſe acquainted with the Magnitude of the Objects themſelves. And this is the Reaſon why Painters do always diminiſh the Magnitude of Objects in their Pictures, in Proportion as they would have them appear at a greater Diſtance. But, as often as we are ignorant

ignorant of the real Magnitude of Bodies, we can never, from their apparent Magnitude, or the Magnitude of their Image on the *Retina*, form any Judgment of their Diſtance; and this is one Reaſon why the Stars do all appear of the ſame Diſtance, though it is certain that ſome are vaſtly nearer than others. For there are an Infinity of Objects whoſe Diſtance we can never perceive, becauſe we are intirely ignorant of their Magnitude.

The *fourth* Thing whereby we judge of the Diſtance of Objects, is the Force wherewith their Colour acts upon our Eyes: For if we are aſſured that two Objects are of a ſimilar and like Colour, and that the one appears more bright and lively than the other, we judge by Experience that the Object that appears moſt bright is nearer than the other.

There are ſome who, in explaining this Matter, would have us believe, that the Force wherewith the Colour of Objects ſtrikes our Eyes muſt decreaſe in a reciprocal duplicate Proportion of their Diſtances, becauſe the Intenſity and Vigour of Light does always decreaſe in that Proportion. That the Intenſity or Vigour of Light does always decreaſe in a reciprocal duplicate Proportion of the Diſtances from

from the radiant Point, I readily acknowledge; for since the Light is diffused spherically, like Rays drawn from the Center to the Circumference, its Intensity at any given Distance from its Center of Activity will be proportional to the Density of its Rays at that Distance; and therefore, if A (*Fig.* 15.) be any radiant or visible Point, and if ABE, ACF, ADG, *&c.* represent the Rays flowing spherically therefrom, the Rays, which at the Distance AB, are diffused through the spherical Surface BCD, at the Distance of AE are dispersed through the whole spherical Surface EFG; but the Density of any given Quantity of Rays is reciprocally as the Spaces they occupy; that is, if the Surface EFG be double the Surface BCD, the Rays at the Surface BCD will be twice as thick or dense as the same Rays at the Surface EFG; and if the Surface EFG be triple the Surface BCD, the Rays at BCD will also be three times denser than the same Rays at the Surface EFG; and universally, whatever Proportion the Surface EFG has to the Surface BCD, the same Proportion will reciprocally obtain betwixt the Density of the Rays at the Surface BCD and the Surface EFG: But (as is manifest from *Archimedes de Sphera & Cylindro*) the Surfaces of Spheres are

are in a duplicate Proportion of their Diameters or *Radii*; and therefore the Thickneſs or Denſity of the Rays, at the Diſtance AB, is to their Denſity at the Diſtance AE, in a reciprocal duplicate Proportion of the Semidiameter or Diſtance AE to the Semidiameter or Diſtance AB: But, as has been already ſaid, the Vigour or Intenſity of Light, in any given Diſtance, is always as the Denſity of its Rays at that Diſtance; and therefore the Intenſity of Light at any Diſtance as AB, will be to its Intenſeneſs at any other Diſtance, as AE, in a reciprocal duplicate Proportion of the Diſtance AE to the Diſtance AB; that is, as the Square of AE is to the Square of AB.

But tho' the Intenſity and Vigour of Light does thus decreaſe in a reciprocal duplicate Proportion of the Diſtances from the radiant Point, it does not from thence follow, that the Force wherewith Objects act upon our Sight, does alſo decreaſe in the ſame Proportion; and that for this obvious Reaſon, *viz.* That as the Intenſity of Light decreaſes by the Diſtance of the Object, ſo does the Magnitude of the Image upon the *Retina* alſo decreaſe in the ſame Proportion; and therefore this Image will be as ſtrong and lively, and will act as powerfully upon the *Retina*, when the Object is at a Diſtance,

as when it is near; and conſequently the Object will at all Diſtances appear equally clear and luminous, unleſs there be ſome other Cauſe that can make it otherwiſe.

For underſtanding what this Cauſe is, we need only let into a darkened Chamber, through a ſmall Hole in the Window-ſhut, a Beam of the Sun's Light: For this Beam being ſeen like a luminous Path, in all Poſitions of the Eye, it is evident that the whole Light does not go forward in its rectilineal Courſe, but that at all Points of the Medium through which it paſſes, ſome Part of it is reflected every Way, by means of which the Beam becomes viſible; and therefore this ſame Beam, by reaſon of the continual Diminution made in its Light, muſt grow weaker and weaker continually, and that in Proportion to the Opacity of the Medium through which it paſſes. If the Air be pure and clear, little Light will be reflected and more will be tranſmitted. If it be moiſt or ſmoaky, more will be reflected and leſs tranſmitted. But be it never ſo clear, ſome Part of the Light will always be reflected or ſtifled in its Paſſage; and conſequently its Intenſity muſt always decreaſe in Proportion to the Diſtance of the Object from which it flows. Seeing then the Intenſity and Vigour of Light does

does thus continually decreaſe, according as the Diſtance of the Object increaſes; it follows that Objects muſt always appear leſs luminous, and more ting'd with the Colour of the Medium through which they are ſeen, the further they are removed from our Eyes; and therefore, when we are otherwiſe aſſured, that two Objects are of the ſame Colour, if the one appear more bright and lively than the other, we are taught by Experience to conclude, that that which appears moſt bright is the nearest; and it is for this Reaſon that luminous and ſtrongly illuſtrated Bodies do always appear nearer than really they are. Whence it is eaſy to ſee why a Chamber appears leſs when its Walls are whitened, and why the Fields and Hills appear leſs when covered with Snow: For, in theſe and ſuch like Caſes, the Brightneſs and Strength of Colour makes them ſeem nearer; from which we conclude they are ſmaller: For we always judge of the Extenſion and Magnitude of Bodies, by comparing their apparent Magnitude with their Diſtance. From this alſo, we may ſee why Fire and Flame appear ſo ſmall when they are ſeen at a Diſtance in the Night-time: For the *Pupil* being then much dilated, more Light will enter the Eye, which, by acting more

powerfully on the *Retina*, muſt make the Object appear much nearer, from which it will be judged ſmaller.

And as bright and luminous Bodies appear nearer, and leſs than they really are, ſo, on the contrary, dark Objects, and Objects that are faintly illuminated, do always appear further off and greater, by reaſon of the Faintneſs and Obſcurity of their Colour. This is particularly obſervable, when dark Bodies are ſeen in the Twilight, which always ſeem further off and greater, than when ſeen in the brighter Light of Day. And it is alſo for the like Reaſon, that the apparent Diſtance and Magnitude of Objects are increaſed when ſeen in miſty Weather: For much Light being intercepted or ſcattered irregularly in its Paſſage through the Miſt, leſs of it will enter the *Pupil*, and conſequently it will act leſs forcibly on the *Retina*, from which the Object will be eſteemed at a greater Diſtance, and bigger than it ought. And indeed the Deception of Sight ariſing from this Cauſe is ſo great, that I have been told, that a diſtant Sheep has ſometimes in a miſty Day been miſtaken for a Horſe. And this Opacity of the Atmoſphere, which hinders Part of the Light from coming to the Eye, is alſo the Reaſon why the Sun, Moon and Stars

Stars appear very faint when near the Horizon, and brighter continually as they riſe higher: For the Tract of Air and Vapours, which lies in the Way of the Rays, is longeſt and thickeſt near the Horizon, and becomes thinner and ſhorter as the Objects riſe higher, and conſequently does leſs obſtruct the Paſſage of the Rays. And this to me ſeems to be one Reaſon why theſe Bodies appear always the bigger the nearer they are to the Horizon: For ſince they appear fainter, they will alſo appear at a greater Diſtance, from which they muſt appear bigger, for the ſame Reaſon that Objects appear ſo in miſty Weather.

From all which I think we may ſafely conclude, that the apparent Colours of Bodies are very uſeful for us in judging of their Diſtances, as often as we are otherwiſe well acquainted with the Intenſity and Vigour of their Colour at any other determined Diſtance. And it is from this Principle, that skilful Painters do upon the ſame Plane repreſent Objects at different Diſtances, by increaſing or diminiſhing the Intenſeneſs of their Colour, according as they would make them appear nearer or further off.

It is indeed true, that the *Pupil*, by its contractile Power, does always proporti-

on itself, as much as possible, to the Vigour and Strength of Light; from which some may think it should be impossible for us to judge of the Distance of Objects from their apparent Colour, or the Force wherewith they act upon our Eyes. But to this it is easy to answer, that the Dilatation and Contraction of the *Pupil* is sensible to us, because it depends on the Motion of the *Uvea* that we feel, which Motion procedes from the different Force wherewith the Light acts upon our Eye, which therefore must always be sensible to us; and therefore, though the *Pupil* should by its Contraction allow no more Light to pass to the *Retina*, when the Object is near than when it is further off, yet we are very sensible of the Intenseness of its Light, because we know that the *Pupil* is then contracted. And besides, when the *Pupil* is contracted, we see more distinctly than when it is dilated, by which also we are assisted in judging of the Distances of Objects.

The *fifth Mean* for judging of the Distances of Objects, consists in the different Appearance of their small Parts; when these Parts appear distinct, we judge that the Object is near; but when they appear confused, or when they do not at all appear,

we

we judge that it is at a greater Diſtance.

For underſtanding this we muſt conſider, that the Diameters of the Images painted upon the *Retina* are always diminiſhed, according as the Diſtance of the Objects they repreſent is increaſed; and therefore, any Object may be made to vaniſh, by placing it at ſuch a Diſtance from our Eyes, as to make its Picture inſenſible, becauſe of its ſmallneſs; but the ſmaller the Object be, it will ſooner vaniſh: Hence it is, that all the ſmall Parts of an Object are not ſeen at every Diſtance; for the leaſt viſible Part will always be ſmaller or greater, according as the Object itſelf is nearer or further off. Thus the leaſt Part that is viſible at one Foot Diſtance, will vaniſh at two Foot Diſtance; and the leaſt Part that is viſible at two Foot Diſtance, will become inviſible at three Foot Diſtance; and ſo forth without End. From all which it is manifeſt, that when the Eye can ſee diſtinctly the ſmall Parts of an Object, it muſt judge that that Object is nearer than any other, whoſe equal Parts are not at all ſeen, or only ſeen confuſedly. Painters are well acquainted with this, who therefore, to repreſent objects at different Diſtances upon the ſame Plane, do always paint them diſtinct or confuſed, in proportion as they

would make them appear nearer or further off; for when the Picture is confused, its small Parts cannot be distinctly seen; and therefore we judge it at a greater Distance than such as have their Parts more distinctly painted.

The *sixth* and *last Mean* which we have for the judging of the Distance of Objects, is, that the Eye does not represent to our Mind one Object alone, but at the same time, it makes us also see all those that are placed betwixt us and the principal Object whose Distance we consider; as for Instance, when we look at any distant Object, such as a Steeple, we commonly see at the same time several Fields and Houses betwixt us and it; and therefore, because we judge of the Distance of these Fields and Houses, and at the same time see the Steeple beyond them, we conclude that it is removed to a much greater Distance, and even that it is every Way larger than when it is seen alone, without the Interposition of any other visible Object; and yet it is certain, that the Image thereof that is painted upon the *Retina*, is always the same in both Cases, provided that we see it from a Place equally distant; and thus you see how we judge of the Magnitude of Objects from their apparent Distance, and how the Bodies

dies, that we ſee betwixt us and any Object, aſſiſt us in judging of its Diſtance, juſt as by the confuſed Remembrance of all that we have done or ſuffered, and of all the Thoughts we have had, we are enabled to form a Judgment concerning the Extent of our Duration; or which is the ſame Thing, of the Magnitude or Extent of Time which has paſſed ſince we performed any particular Action: For it is theſe ſucceſſive Thoughts and Actions which enable our Mind to judge of the paſt Time, or the Extent of any Part of our Duration; or rather the confuſed Remembrance of all theſe ſucceſſive Thoughts and Actions, is the ſame Thing with the Judgment of our Duration, as the confuſed Sight of Fields and other Objects that are betwixt us and the Steeple, is the ſame Thing with the Judgment we have of its Diſtance.

And this affords us another Reaſon why the Moon appears greater when ſhe riſes, than afterwards when ſhe is much elevated above the Horizon; for when ſhe riſes, by reaſon of the Interpoſition of the Fields, ſhe appears removed to the Diſtance of ſeveral Leagues, *viz.* beyond the ſenſible Horizon, or that Part of the terraqueous Globe which terminates our Sight; whereas at a greater Height, no Body being interpoſed

terpoſed betwixt her and us, we don't judge that ſhe is above half a League diſtant. But ſeeing Objects do always appear ſmaller or greater according as we judge them nearer or further off, it follows that the Moon muſt appear greater when near the Horizon, than afterwards when ſhe is much elevated, by reaſon of the different Judgments we form of her Diſtance in thoſe Caſes.

There are then *ſix Means* which ſerve our Sight for judging of the Diſtance of Objects, *viz.* Their apparent Magnitude, the Vivacity of their Colour, the Diſtinction of their ſmaller Parts, the neceſſary Conformation of the Eye for ſeeing diſtinctly at different diſtances, the Direction of their *Axes*, and the Interpoſition of other Objects betwixt us and the principal Object whoſe Diſtance we conſider. Of theſe ſix Things, which ſerve to make Objects appear near or far off, there are only the three firſt that Painters can poſſibly make uſe of in their Pictures; whence it is that it is impoſſible for them perfectly to deceive the Sight. But in the Decoration of Theatres, where all theſe ſix Things are artfully conjoin'd, one needs not be ſurprized if he cannot help being deceived; for in the Scenes, Care is taken to diminiſh the

Magni-

Magnitude of Objects, in proportion as one would make them appear far off, while at the ſame time they diminiſh the Vivacity of their Colour, and likewiſe paint them confuſedly, that the ſmaller Parts may not be ſeen diſtinctly; And thus the three firſt Means for judging of the Diſtances of Objects are perfectly ſatisfied. And for the three laſt, they repreſent on different Planes obliquely plac'd, and a little remov'd from each other, the Parts of the ſame Object which they would make appear at different Diſtances, ſuch as the Pillars of any of the Orders of Architecture, by which means the two Eyes are obliged to change their Direction for ſeeing diſtinctly the different Parts of the Object, whether on the ſame or different Planes. And this Repreſentation of Objects, or the different Parts of the ſame Object on inclined Planes, plac'd at a Diſtance one behind another, does alſo occaſion that Change in the Conformation of our Eyes, by which we likewiſe judge of Diſtances that are within the Limits of *diſtinct Viſion*; and when the Object is beyond the furtheſt of theſe Limits, as indeed all the Repreſentations made in the Theatres commonly are, the Degree of Confuſion ariſing from this Poſition of the Planes, ſupplies the Place of this Change in the

the Conformation of the Eye in forwarding the Deceit; ſo that all the ſix Means whereby we judge of the Diſtance of Objects are ſatisfied, excepting the laſt, which might a little diſcover the Cheat, were not Care taken to repreſent, according to the ſtricteſt Rules of Perſpective, a Series of Objects lying at different Diſtances on the inclin'd and differently remov'd Planes, of which their Scenes are compoſed; ſo that when we view any of theſe Objects, we cannot help judging them further off than really they are, becauſe we ſee ſo many other Objects placed betwixt them and our Eyes. And thus you ſee how by Art, all the Means whereby we judge of the Diſtances of Objects may be ſatisfied, and we thereby deceived: And what contributes yet further to the Perfection of the Cheat, is the falſe Light wherewith theſe Decorations are always illuminated.

Having now finiſhed what concerns the Motion of our *Cryſtalline*, whereby the Eye is adapted to the various Diſtance of Objects, it may not be improper, before I diſmiſs this Subject, to explain a little another Motion of the *Cryſtalline*, which only obtains in Birds, and is performed by means of the *Marſupium nigrum*, or *Bourſe noire*, as the *French* call it.

This

This is a Membrance in Form of a Purse, which arises from the Entry of the optick Nerve, and passes through the *vitrous* Humour, to its Insertion in that Part of the Edge of the *Crystalline* which is next the great *Canthus*. Thus it is described by the *French* Academists, and by *M. Perrault* in his *Mechanique des animaux*, from whom I have caused it to be copied at *Fig.* 16. which represents the half of the Globe of an *Ostrich*'s Eye in which A is the *Crystalline* Humour, B the *optick Nerve*, and C the black Purse attached above to the *Crystalline*, and below to the *optick Nerve*. But in some Birds I have found this Membrane of a rhomboidal Figure, agreeable to the Account given of it by Dr. *Petit*, in the *Memoires de l'Academie Royale*, *an.* 1720.

This Membrane is always covered with a black Pigment, which is of a more intense Colour than that of the *Uvea* or *Choroides*; whence it is that *M. Perrault* and the *French* Academists conjecture, that its only Use is to assist the *Choroides* and *Uvea* in preparing the Nourishment of the Humours of the Eye, which by reason of the transparent Purity that is requisite for them, must have an Aliment very pure and wholly exempt from the gross, earthy and black

black Parts, by which Bodies are rendred opaque. For these Parts, which may be called the *Lees of the Blood*, are separated therefrom, and retained in the *Choroides* and *Purse* of the optick Nerve, which are sullied and blackned therewith.

I know that the Use of this Blackness in the *Uvea* and *Choroides* is seldom extended to the Preservation of this Transparency in the Humours of the Eye: For the most part of Authors suppose, that the Blackness of the *Uvea* serves only for rendring this Membrane more opaque, that no Light may enter the Eye but what passes the *Pupil*, and that the Blackness of the *Choroides* has no other Use than to stifle the Rays of Light that fall thereon, and keep them from being reflected back upon the *Retina*; which might efface the Images of Objects, or at least render them more confused and imperfect. But if we consider that the Back-side of the *Choroides*, next the *Sclerotica*, is likewise covered with this black Pigment, and that in all Animals, even those which have its concave Side next the *Retina* of another Colour, as *Aquapendente* in his Treatise *de oculo*, § 1. *cap.* iv. observes, we cannot but think that it likewise contributes to the Preservation of that Transparency in the Humours, which is absolutely neces-

TAB. 11 Vol. IV

Fig. 1

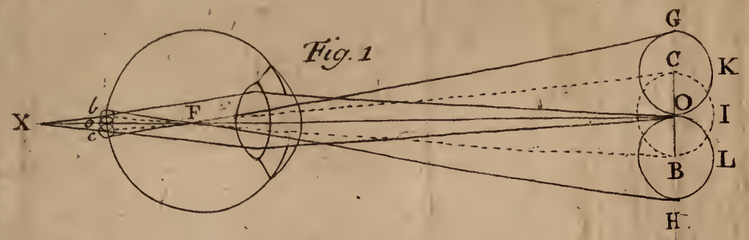
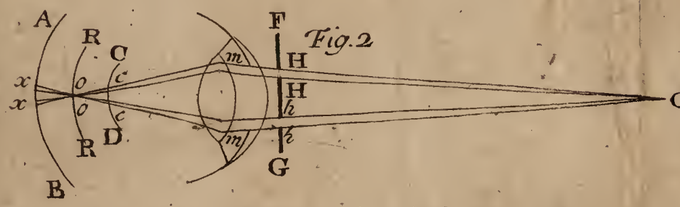


Fig. 2



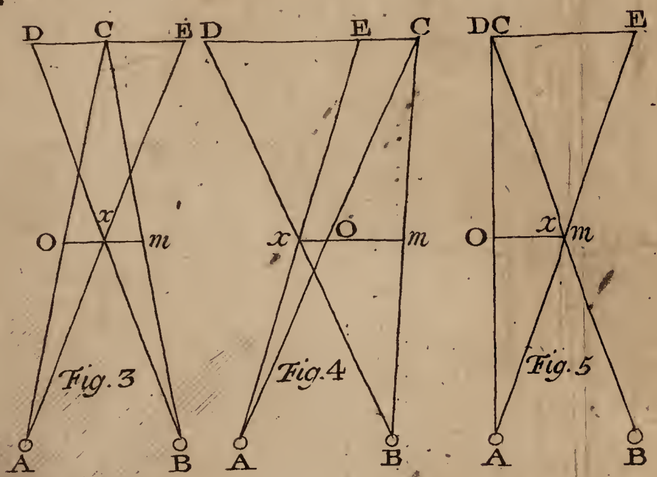


Fig. 3

Fig. 4

Fig. 5

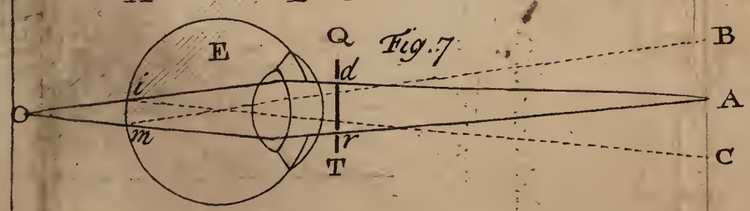
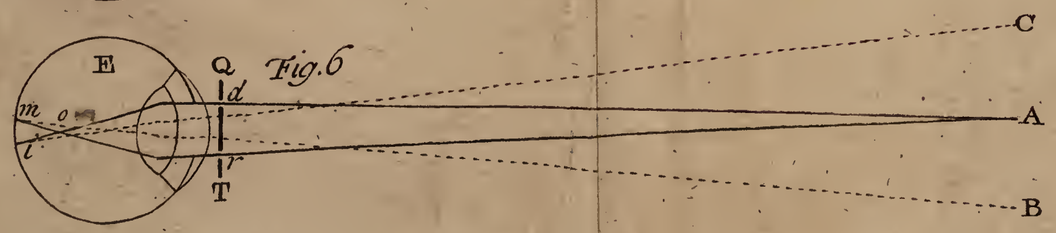


Fig. 7



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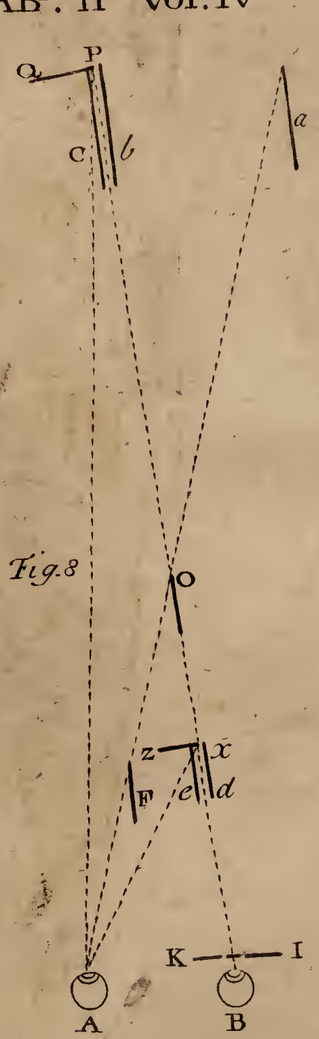

Fig. 8

Fig. 9

Fig. 10

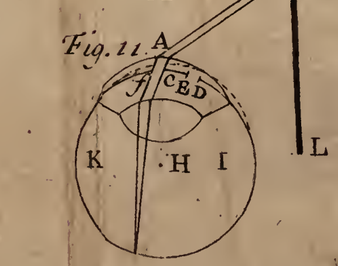

Fig. 11

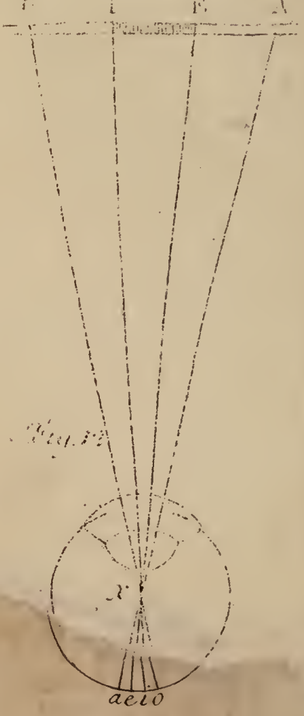

Fig. 12

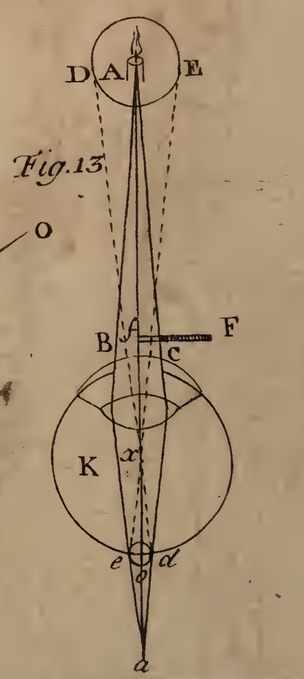

Fig. 13

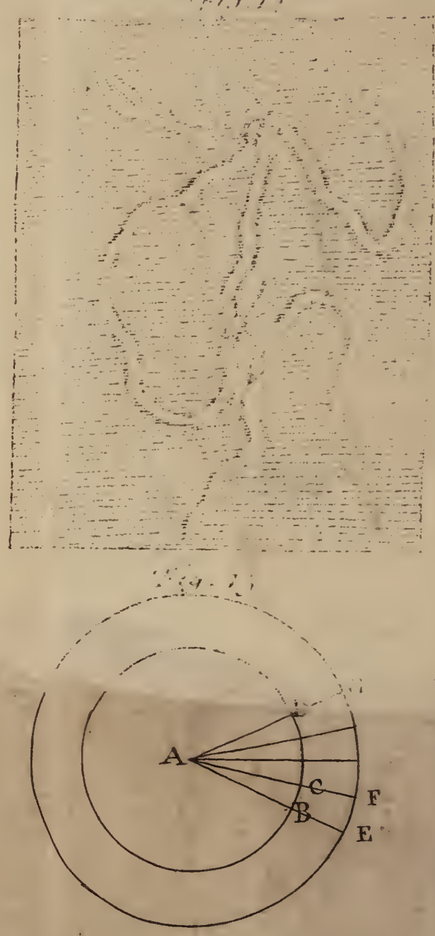

Fig. 14

Fig. 15

Fig. 16

R. Cooper Sculp.

necessary for the Transmission of Light; and that because there appears no other Reason for the black Colour upon the Back-part of the *Choroides*: Thus the *Lion*, *Camel*, *Bear*, *Ox*, *Deer*, *Sheep*, *Dog*, *Cat*, and many other Quadrupedes, and even some of the Bird-kind that are not endowed with a good Sight, such as the *Owl*, and other nocturnal Birds, which have the Inside of the *Choroides* of a blue, green, yellow, pearl, or other bright and resplendent Colour, are never found to want a considerable Quantity of this black mucous Pigment upon the convex or backside of this Membrane, which can serve for nothing else but for rendring the Aliment which goes to the *Crystalline* and *other Humours* of the Eye more pure and free from the gross black Parts, which might render them opaque and unfit for transmitting the Light.

It therefore seems necessary that this Tunicle should be provided with Glands proper for secerning this black Mucus, that the *Cornea* and *Humours of the Eye* may not be tinged with any Opacity: For as in the Jaundice the whole Body becomes yellow, by reason of the Bile which is not duly secerned in the Liver; so it is not to be doubted but the *Cornea* and *Humours of the Eye*, would soon lose of their Transparency,

rency, were it not for the secretory Power of the *Uvea* and *Choroides*, by which the Blood which goes to their Nourishment is freed of its most opaque and black Parts: Whence it is that Animals, whose Blood abounds most with blackish Particles, have this Membrane proportionally of a more intense black Colour; for it is observable that those who have most Blackness in their Hair or Feathers, have this Membrane also most black.

There is a Mechanism not unlike this, very remarkable in the *Sepia* or *Cuttle-Fish*, which is known in the Apothecary Shops from a kind of Shell commonly called *Os Sepiæ*, wherewith its Back is covered: This Animal is provided with a Bag towards the Throat, near the Stomach, whose Use is to separate and contain all the opaque black Particles of its Blood and Humours; hence it is that the Substance of this Fish is of a white Colour, which otherwise probably would have been black: For the Humour contained in this Bag is so very black, that it exceeds that of Ink itself, and one Gutt thereof is sufficient to blacken many Basons of Water. Whence it is that this Fish does easily save itself from Fishers and other Fish that seek to devour it, by expressing a little of this Liquor into the Wa-

ter

ter in which it ſwims; and therefore *Plutarch* very agreeably ſays, that this Fiſh imitates what *Homer* makes the Gods do, to hide and deliver their Friends from the Danger to which they are expoſed in Battle, which is to cover them with a dark Cloud, that they may eſcape ſafe. Now as the Subſtance of this Fiſh becomes white, from the Separation of all the opaque black Particles contained in its Blood and Humours; ſo it is more than probable that the *Cornea* and *Humours* of the Eye retain their Tranſparency; becauſe the Blood which goes to their Nouriſhment is, by the ſecretory Power of the *Choroides* and *Uvea*, freed of all theſe opaque black Particles which could in the leaſt tarniſh them, or diminiſh their pure Tranſparency. And this may poſſibly be one Reaſon why thoſe Creatures that ſee beſt, ſuch as *Eagles* and other Birds of Prey, have the *Pupil* very black; and on the contrary, the *Owl*, *Lion*, and other Animals whoſe Sight is not ſo good, have this Hole leſs black; becauſe the bottom of their Eyes is not covered with this black Pigment.

This much being premiſed concerning the Uſe of the *Choroides* and *Uvea*, it will not be queſtioned but the *Bourſe noire* has a ſimilar Office, and that it ſerves to aſſiſt

them in the Separation and Reception of all those opaque black Parts of the Blood which might have sullied the Humours of the Eye; and that for these Reasons, 1*mo*, Because this Membrane is never found in any Creature but Birds, and that because of all other Creatures they have Occasion for the best Sight, by reason their Flight places them at a considerable Distance from Objects which they ought to see. 2*do*, Because as Birds naturally fly more high, and by that means require a more piercing Sight, this Part is always proportionally of a more intense black Colour: Thus in *Eagles*, and other Birds of Prey, it is always covered with more of this black Mucus than in our domestick Birds, which either do not fly, or do not fly so high, such as *Geese*, *Hens*, &c. 3*tio*, Because in the *Demoiselle of Numidia*, that strange dancing or buffoon Bird, which is the celebrated and wonderful *Otus* of the Antients, and which, by reason of certain ways of acting, wherein it seems to imitate the Gestures of a Woman who affects a Grace in walking and dancing, has of old by *Aristotle* been named *Actor* or *Comedian*; I say, this Bird, which is the only one wherein the *French* Academists found this *black Purse* wanting, the *Choroides* is a great deal

deal blacker and thicker than ordinary, as if the whole Dregs of the Blood, which in the Eyes of other Birds ſhould be retained in the *Choroides* and *black Purſe*, had here been collected into the *Choroides* alone.

Theſe are Reaſons that determine us to agree with *Monſ. Perrault* and the *French* Academiſts, in thinking that the Uſe of this Part is to preſerve that Tranſparency in the *Humours* of the Eye ſo neceſſary for Viſion, though at the ſame time we are of Opinion that it has yet another Uſe no leſs conſiderable, which I ſhall now explain.

Every body knows that in Birds their Eyes are not as in Man, Dogs, and ſuch other Creatures as look the ſame way with both Eyes plac'd in the Fore-part of their Head, but ſo much towards the Sides thereof, as makes it impoſſible for them to direct both of them to the ſame Object. Neither does this Situation of their Eyes ever allow them to be turned towards an Object placed ſtraight before them: Hence it is you ſhall frequently obſerve, that when any Bird wants to ſee an Object that is ſtraight before it, it does turn the Side of its Head that way, that the Rays of Light may fall directly upon its Eye; but then their Sight muſt, in ſome meaſure, be weaker, becauſe

the Object is only ſeen with one Eye. Now this being underſtood, it is eaſy to ſee that, without this *Marſupium nigrum*, it would have been impoſſible for Birds to ſee their Food wherewith they are nouriſhed; becauſe the Rays of Light that come from an Object placed near the Extremity of their Bill, would, in falling obliquely upon their Eyes, have rendred their Sight prodigiouſly confuſed and imperfect; juſt as the Image of a Candle, or other Object, is confuſed, when made by a *Lens* placed obliquely, for the Picture caſt on the Paper is always more and more confuſed, in proportion to the oblique Situation of the *Lens* through which the Light paſſes; and therefore, to prevent this Defect in the Sight of Birds, Nature has very wiſely provided them with this Part, which being of a muſcular Subſtance, does, by its Contraction, draw that Edge of the *Cryſtalline* next the *great Canthus*, towards the Bottom of the Eye, and render its Situation ſuch, as the Rays of Light which come from Objects placed directly before them, and towards the Extremity of their Bill, may fall upon it more perpendicularly, which was abſolutely neceſſary for diſtinct Viſion. This is an admirable and truly elegant and ſurprizingly beautiful Piece of Mechaniſm for

per-

perfecting the Sight of thoſe Animals, that cannot turn their Eyes to Objects ſtraight before them; and to confirm this Opinion, it may be worth while to obſerve, that this *Bourſe noire*, as the *French* call it, though it be tinged black, like the *Choroides*; yet if it be waſh'd, it appears to be compoſed of muſcular Fibres, not unlike the *Ligamentum ciliare*. Nor is it any ſolid Objection to this, ſuppoſing that this Membrane ſhould not always be found inſerted into the *Cryſtalline*; for it being ſo firmly fixed unto, or embodied in the *vitrous* Humour, that the *vitrous* Humour hangs firmly to it, and is not ſo eaſily parted from it, all the Motions of this Membrane are eaſily communicated to the *vitrous* Humour, and by conſequence to the *Cryſtalline* which is connected to it.

I ſhould now proceed to the Motions of the *Uvea*, whereby the *Pupil* is contracted and dilated, which is indeed by far the moſt beautiful and entertaining, as well as the moſt uſeful of all the Motions that belong to our Eyes: But the Humour of ſcribling will hold out no longer; and it is well that it is ſo, for I find this Paper has already ſwelled much beyond its intended Bulk, for which, as well as for ſeveral Defects and Imperfections, and poſſibly ſome Mi-

stakes, which could not be so easily avoided, considering the Hurry in which it has been written, I should now make an Apology. But as a tedious Apology for a tedious Performance would be insufferable, I I shall add nothing further.

XV. *A Wound with a hot Iron penetrating the* Pelvis; *by Dr.* ANDREW WILLISON *Physician at* Dundee.

THE Regard Physicians and Surgeons have for their own Character and Reputation, makes them often shy to undertake the Cure of Patients, where they have no Hope of Success, and may be blamed by the Ignorant, if the Disease is fatal; nay, the Despair of doing good is sometimes a Reason of proper Remedies being neglected as needless. But as every one can save himself from Reproach, by making a due Prognostick of the Event to the Relations, and People have recovered beyond Expectation, *præstat anceps quam nullum tentare remedium*, the Sick should have all the Assistance which the healing Art can give.

By this general Reflection I would introduce the History of a Case, which contains indeed

indeed no new Method of Cure, but where Nature, with a little Aſſiſtance, made a Cure of a Diſeaſe which I look'd on as deſperate.

In the Beginning of *March* 1735, a Smith puſhed a red-hot Iron with ſuch Force into the Buttock, an Inch and a half from the *Anus*, of a young Man of twenty Years of Age, that the Point of it came out through the *Linea alba*, about an Inch above the *Oſſa Pubis*, having pierced through the *Pelvis*. After ſome Hours I ſaw him. His Pulſe was low and intermitting. He had violent bilous vomiting from time to time, great Pains in his Belly, Thirſt, Watchings, cold Sweats and Faintings, with ſcarce any Blood from the Orifices of the Wound.

I ordered fourteen Ounces of Blood to be let from him, and to inject an emollient Clyſter with Turpentine, which operated well, and he was ſomewhat relieved of the Pain in his Belly. He reſted ill all Night; and, next Morning, his Symptoms continued, and he had paſſed no Urine now twenty Hours after receiving the Wound, notwithſtanding his having drank great Quantities of Liquor. His Pulſe was more frequent and harder. I cauſed twelve Ounces of Blood to be taken, and after fomenting his Belly well with Emollients, rubbed it with

Ol. Scorpionum. By which the Pain became much leſs. Thirty Hours after receiving the Wound he voided a little Urine with much *Mucus*, ſuch as People with Stones in their Bladder commonly paſs. At Night the Clyſter was repeated, and brought off a great deal of ropy Slime with it. An Emulſion with ſome Nitre was given for ordinary Drink, and a cordial Julep did him much Service in moderating the vomiting.

The third Day he again uſed the Fomentation, Clyſter and Emulſion. His Urine and Excrements came now plentifully by the lower Wound near the *Anus*, little being evacuated the natural Way, except a little ſlimy Urine which he paſſed with ſharp Pain. I ordered diluted *Digeſtive* and *Mel-Roſe* warmed, to be injected into the Wound.

The bad Symptoms continued ten Days, and the ſame Medicines were uſed. After this Time his Urine came the natural Way. In ten Days more the Excrements did the ſame, and in ſix Weeks he was cured, having taken a low vegetable Diet all the Time, with thin weak Liquors for Drink, and Opiats at Night.

Towards the End of the Cure he was emaciated, and had a Cough, but recovered of both by a Milk Diet.

XVI. *A Stone in the Bladder formed on a Needle; by Mr.* ANDREW BROWN *Surgeon in* Dalkeith.

A Gentleman's Daughter in this Place began, at two Years of Age, to be afflicted with Colick Pains and Difficulty of making Water, which were commonly removed by Clyſters, Purgatives, Diureticks, and ſome other Medicines. When three Years of Age, her Diſeaſe had more the Appearance of *Gravel*, for the ſevere Pains were about the *Regio Pubis*; ſhe had partial Obſtructions of Urine and frequent Vomiting, but never complained of her Back. Theſe Symptoms not yielding to her former Medicines, I put her into the *Semicupium*, which, with Injections, relieved her. She was ſo ſenſible of the Benefit of the *Semicupium*, that ſhe frequently deſired it, and ſometimes came unwillingly out of it.

Her Pains and Obſtruction of Urine increaſed all the following Year, the warm Bath being the only Medicine that gave her Relief, for in it only ſhe made Urine freely; at other Times it either came away inſenſibly, or in very ſmall Quantity at once.

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In the End of *February* 1735, when she was four Years and two Weeks old, she complained of great Pain in the *Pudenda*, putting her Fingers there as if she would extract somewhat. All the external Parts swelled greatly, and inflamed. Her Mother then sent for me. Upon pressing the right *Labium*, I felt like a Fluctuation of Liquor in it, and on the posterior Part of the *Rima* there was some Pus. I fomented the Parts with warm Milk, and applied an emollient Poultice upon them.

Next Day the Quantity of Pus was greater, and she was easier, but still aimed at extracting what pain'd her. The same Applications were continued.

On the second Day her Mother observed a white hard Substance in the Passage, and the Child was miserably tortured with Pain. In the Evening, while a Fomentation was applying, the Stone, which you will receive with this, fell into the Bason. It weighed then more than half an Ounce, and is, you see, grown round a Needle, the Ends of which stand out. See *Tab.* III. *Fig.* 1, where it is represented of the natural Size with the Ends of the Needle A and B standing out.

The Child was too young to give any Account of what had happened to her so long

long before; and the Parents knew of no Needle ſhe had ſwallowed, or of any Pains ſhe had had, till the Colick Pains, which I mentioned in the Beginning of this Hiſtory.

When this Stone came away there was neither Blood nor Pus with it, nor had ſhe paſſed any Blood before. Since that Time ſhe has ſtill complained of Gravel Pains, and the Urine flowing involuntarily excoriates the Skin.

XVII. *An* Aneuriſm; *by* Alexr. Monro, *Profeſſor of Anatomy in the Univerſity of* Edinburgh, *and* F. R. S.

THE Caſes of *Aneuriſms* cured by Operation are ſo few in Books, that I perſwade my ſelf you will not refuſe a Place in your *Collections* to a ſecond, eſpecially that it ſerves to confirm a general Doctrine which you have already publiſhed. (See *Art.* 15, 16 and 17 of *Vol.* II.) And that ſome Improvement on the Operation is likewiſe to be propoſed along with the Hiſtory.

Andrew Rady, living in *Galloway*, had the Misfortune, in being bled in the baſilick Vein

Vein of the right Arm, by ſome Gardner there, to have his Artery hurt, which was followed by an *Aneuriſm*. Some more than a Year after, he came to Town here, and was received into the *Infirmary* in *May* 1735. On the 22d Day of that Month, Mr. *George Cuningham*, the Surgeon then in Attendance, performed the Operation. After the *Tourniquet* was applied, Mr. *Cuningham* laid open the Tumor from one End to the other, with one longitudinal Inciſion; then taking out the polypous Subſtance, and a ſmall Quantity of liquid Blood, the ſmall Aperture of the Artery was ſo plainly ſeen, that I put a Probe into it, and raiſed the Trunk of the Artery, while he paſſed the Needle behind it, the Sides of the Wound being held aſunder in the mean Time by two blunt Hooks. The proper Membrane of the Tumor was conſiderably thicker and ſtronger than in *James Foreſt*'s *Aneuriſm*, and required Force to puſh the blunt *Aneuriſm-needle* through it, but the Nerve was preſſed by the Tumour a good Way from the Trunk of the Artery, ſo that there was no Danger of taking the Nerve within the Ligature. After making the ſuperior Ligature, the *Tourniquet* was untwiſted, but no Blood came by the Orifice, which ſhew-

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ed the anaſtomoſing Canals to be very ſmall; the ſecond Ligature was however made below the Orifice for Security. The Cavity was filled with ſoft Lint, and the other ordinary Dreſſings applied. That Afternoon his Hand ſwelled and became warm, which removed all our Fears of the Circulation being intirely ſtopped. No Pulſe was to be felt on either Side of the Wriſt for ſeveral Days; but before the 5th of *June*, when both the Ligatures ſuppurated off, the Pulſe was plainly to be felt on both Sides of the Wriſt, and he cured ſoon, having as much Strength and Motion in that whole Member as ever.

To make this Operation more ſpeedy and ſafe, I would propoſe, that as ſoon as the longitudinal Inciſion is made, and the *Polypus* with the Blood is removed, the Patient's Elbow being bended ſome Way, the Operator ſhould take hold of the humeral Artery with the Thumb and Forefinger of the left Hand, and gripping it towards the back Part, ſhould puſh the Needle cloſe upon his own Nails, by which he has a ſure Direction whereby he may ſhun the Nerve, which he can readily diſtinguiſh from the Artery by feeling, and can in that Poſture of the Arm eaſily draw the Artery

ſo far outwards as to keep free of the Nerve.

The Operation then of the *Aneuriſm*, which appeared by the Deſcription Surgeons gave of it, to be very nice, difficult, tedious and precarious, may be done eaſily, quickly and ſafely, by opening the whole Tumour at once, and then putting the Ligature about the Artery as juſt now deſcribed.

XVIII. *A white Swelling of the Knee; by* the ſame.

MAny Inſtances are daily ſeen of that tormenting, dangerous Diſeaſe, the *white Swelling* of the Joints; but before one has an Opportunity of examining them by Diſſection, to underſtand the Nature of the Diſeaſe right, the Matter has become ſo ſharp that it erodes the Bones themſelves, and then one ſees the ſame Thing as he would do in a *Spina ventoſa*. I met with one Patient in our Infirmary, whoſe Joint of the Knee was juſt as far advanced as I wiſhed to examine, when it was amputated. It gave me a better Idea of that Diſeaſe than I had before, and poſſibly may do ſo to

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ſome of your Readers, which induces me to ſend it to you.

Iſabel Blackadder, a young Woman of a delicate tender Conſtitution, having hurt her left Leg by a Fall ſome Years ago, an Ulcer broke out near her Heel, and ſeveral Pieces of Bone caſt out at it; but it recovered ſo well, that ſhe went to Service again.

In the End of 1734, having hurt the ſame Leg by another Fall, the Knee ſwelled, became very painful and ſtiff, for which ſhe was taken into the Infirmary; where, after Blooding, a few Doſes of *Aquila alba*, and Embrocation with *Aq. mindereri*, the Swelling and Pain both ſeemed to abate, but ſoon became as bad as formerly, and never afterwards yielded to any Medicines.

The Skin of the ſwelled Parts was not diſcoloured, and on the Inſide of the Joint a Fluctuation was felt in one or two Points, but the Quantity of Liquor appeared very ſmall, and the Fluctuation had a different Feeling to what commonly *Pus* collected in a Cavity has. Her Pains were very ſharp, eſpecially upon the leaſt Motion of the affected Leg, her Fleſh and Strength decayed daily, and the hectick Symptoms increaſed; which at laſt brought her ſo low, that ſhe could not be raiſed to a ſitting

Poſture

Poſture without fainting, which brought her under the Neceſſity of ſuffering the Member to be amputated.

In this Condition ſhe was when the Member was cut off above the Knee by Mr. *Douglas*, after which ſhe recovered daily, and walks on a wooden Leg of the ſame Form which *Alexander Sheppard* uſed, whoſe Caſe I ſhall ſoon extract alſo from the Records of the Infirmary to ſend you. (See *Art.* XXI.)

When the diſeaſed Joint was diſſected, all the cellular Membranes, in which Fat is naturally contained under the Skin, between the Muſcles and Tendons, and upon the Ligaments, were found full of a glairy Matter, which had inſinuated itſelf ſo much every where, and had made the other Parts ſo ſoft, that we could ſcarce diſtinguiſh one from another. In ſeveral Places of this glairy Subſtance there were ſmall Cavities full of *Pus*. When the Articulation of the Knee was opened, all the mucous Glands and fatty Membranes were ſeen in the ſame Condition with the exterior Parts; the *ſemilunar Cartilages* themſelves between the *Tibia* and *Femur* being quite ſoft, and with the ſame cellular mucous Appearance that the Glands had. We alſo obſerved ſome *Pus* within the Cavity of the Joint, but

but the Extremities of the Bones were ſcarce begun to be eroded.

XIX. *Part of the Cartilage of the Joint of the Knee ſeparated and oſſified; by* the ſame.

IN the Letter incloſed in this Paper, you have an Account of a *white Swelling* from a very uncommon Cauſe, treated by my good Friend Dr. *Simſon* Profeſſor of Medicine in the Univerſity of St. *Andrew*'s. (*See the following Article.*) In it the Doctor does not, and indeed could not, determine how the looſe Bone he deſcribes came into the Cavity of the Articulation. I believe it may not be diſagreeable to you to relate what I ſaw once in the Joint of the Knee, very like to the Bone he took out, and which may ſerve to explain that Phænomenon.

In the Body of a Woman aged forty, which I diſſected in *February* 1726, I found, within the Ligament of the Articulation of the right Knee, a Bone of the Shape and Size of a ſmall Turky Bean, depending by a Ligament half an Inch long from the external Side of the *Tibia*. The

Bone, when cut, had only a thin external firm Plate, being composed within of Cells which were full of Oil. On separating the *Femur* and *Tibia*, I saw the Ligament came out from the exterior Edge of the Cartilage covering the exterior Cavity of the *Tibia*; and more internally a Part of the Cartilage of the *Tibia*, of the same Shape with the Bone, was wanting. In *Tab.* III. *Fig.* 2. A is the Bone hanging by its Ligament, and B is the Bone cut open. The Circumstances of this Malefactor made it impossible for me to know exactly her Symptoms or Complaints before her Execution.

XX. *An uncommon Tumor of the Knee, with Remarks on the* white Swellings *of the Joints; in a Letter to Mr.* MONRO *Professor of Anatomy, from Dr.* THOMAS SIMSON *Professor of Medicine in the University of St.* Andrew's.

SIR,

THE Glory of Medicine consisting in the Cure of Diseases, every Discovery that contributes to make this more certain, must be looked upon as of moment in that Art. Upon which Account, I look upon the

the Hiſtory of the particular *Species* and *Individuals* of Diſeaſes, as a Part of our Art that can never be fully enough enlarged upon: For if it be in Diſeaſes as it is in *Botany*, that frequently the *Species*, nay the *Individual*, has ſuch particular Properties as to ſatisfy us that they have a moſt peculiar Nature of their own, however much beſides they have in common with others, we cannot be ſure till a Trial ſatisfies us, whether or not this peculiar Nature will require a particular Conſideration in the Cure, and conſequently ſhould be animadverted to, to make our Method the more certain and extenſive. It is this Conſideration, Sir, which makes me lay before you an Inſtance of what is called by our *Engliſh* Writers, the *white Swelling* at the Joints, which aroſe from a moſt ſingular Cauſe.

A Countryman in the Neighbourhood of St. *Andrew*'s had for ſeveral Months an Uneaſineſs in walking, from a Pain in his left Knee, which had got no obſervable Injury: When the Pain was greateſt, he found ſomething of a hard Body immediately under the *Rotula*, generally at the Inſide of the Leg, though ſometimes at the oppoſite, and could get no Eaſe, till by chaffing it upwards with his Hand he made it diſappear; the Parts about were tumified, as we

find in the Caſe of a *white Swelling* at this Joint, though to no great Height: The hard Body always made its Appearance upon walking; ſo that when I came to ſee him, he was obliged to take ſome Turns through the Houſe, before he could make me ſenſible of it. I eaſily catched it betwixt my Thumb and Finger, where it felt ſo diſtinctly, that I could not ſuppoſe but it had its Seat in the *Tunica Adipoſa*, immediately under the Skin, which made me immediately pull out a Biſtory to open into it; but my Patient, not having Reſolution to allow me, did plead ſome Days Delay to think upon it. After which, he came to my Houſe with ſome of his Friends, and acquainted me that he would ſubmit to the Operation, he being perpetually upon the Rack, by the falling down, as he called it, of that Body, which happened every Moment of the Day he offered to ſtir. It appeared ſo looſe and ſuperficial, that I had no manner of Doubt of Succeſs, and ſo with a Scalpel immediately began to make an Inciſion upon the Body, which in the mean Time I held betwixt my Finger and Thumb; But to my great Surprize, when I had made my firſt Inciſion through the Skin and Fat, I found a membranous ſtrong Bag between me and the Tumor, which made

made me ſenſible for the firſt Time where this floating Body was lodged; however, though now I reckoned the Operation of more Importance than formerly, I was ſatisfied nothing elſe could help my Patient than to continue the Inciſion, which I did, and upon entring the Bag, there was at leaſt four Ounces of the *Synovia*, or a thick pellucid Humour iſſued out with the hard Body, which I found much of the Shape, though larger than a Kidney Bean; it then appeared wholly cartilaginous, and very ſmooth and protuberant. But, upon drying, it ſhrunk in and ſhewed itſelf a Bone covered over with Cartilage. In cutting thro' the Bag, which was firm and thick, the Patient expreſſed the utmoſt Pain, which turned eaſier upon taking out the Body, and after the Evacuation. I earneſtly deſired the Patient to ſtay in the Town that Night, that I might have the better Acceſs to attend him; but nothing would perſwade him. So that, after ſome Hours Stay, he mounted Horſe, and rode under Night two Miles to the Country, in time of a moſt keen Froſt, which raiſed the Pain of his Knee to the greateſt Height, and obliged him to ſend expreſs for me at Midnight. I ordered it to be fomented with the moſt anodyne ſoftning Materials I could contrive,

but with little Succeſs; his Knee ſwelled excedingly all round: And what was obſervable, he did not make ſo much Complaint of the Place where the Inciſion was made, as at the oppoſite Side. He was bled and purged with *Calomel* frequently, but all to no Purpoſe, being, notwithſtanding all that could be done to him for a Month's Time, ſeldom free of horrid Cries and Complaints; nor could he allow his Leg to be moved in the moſt gentle Way we could contrive, and never ſlept but when he took Opiates. Bladders of Water round his Leg, as warm as he could bear, had little Influence, but Water ſyringed took more Effect, which I made two Men do by Turns for near an Hour at once, from a large Clyſter Syringe; but though this cauſed the Pain and Swelling to abate, yet it did not carry it quite off till I applied a *Cauſtic* to the Outſide of the Knee, which being kept running, and the Syringing continued, it gradually wore off in about a Year's Time: So that he is quite free of all Complaint and Swelling, and walks about without any Impediment.

Amongſt the many Cauſes of this Swelling about the Knee, I have not met in any Author ſuch an one as this looſe Body within the Bag which environs the Joint;

I muſt leave it to my Readers to ſuppoſe whence it had its Riſe: Only I muſt give my Opinion, that it was the Irritation of this looſe Body which had produced ſuch a Quantity of *Synovia*, by which the Bag was made to ſtretch and become ſo contiguous to the Skin, and allowed its Gueſt ſuch an eaſy Motion from Side to Side, tho' it appeared moſt at the Inſide, which is the moſt depending. But I would have it obſerved what an obſtinate Swelling the Irritation cauſed by the Wound, the hanging it in riding, and the Cold of the Night had produced, ſo that it ſtood out a very long Time againſt the moſt efficacious Remedies, as all theſe Swellings about the Knee, or about any other Joint, do for moſt part. I have had ſeveral of them of a ſhorter ſtanding with the worſt Symptoms, ſuch as a conſiderable Swelling round the Joint, while a few Places ſeemed to be riſing by themſelves, forming, as one would have reckoned at firſt Look, an Abſceſs; which with Purging and the Fall of cold Water, according to *Cheyne*'s Method, I have in a few Weeks carried off. To ſome I applied with like Succeſs the Fall of warm Water, according to *Le Dran*'s Method. To others I applied ſometimes the cold and ſometimes the warm Water by Turns with like Succeſs.

In thoſe of longer ſtanding, though I never ſaw any of them carried off quite, yet I always found they got Relief from the extravagant Pain, againſt whoſe Return they can never be ſecure, by the ſame Methods. Several of thoſe I have had under theſe Caſes could give no Account of the Riſe of the Trouble. Some Women have contracted it under the Diary Fever (the *Weed*) they are ſubject to in Child-bed. A great many get it by Wounds or Bruiſes about the Parts, which are capable of the eaſieſt Irritation, and never miſs to bring all the neighbouring Parts to ſuffer; and it ſeldom miſſes that the *Flexor-Tendons* turn rigid under the Diſeaſe; the Patient generally, for Eaſe, keeping the Parts about the Joint in as relaxed a State as poſſible; and thus the *Flexor-Tendons*, which ſhare the Pain and Irritation, turn rigid and ſtiff: Wherefore, I would rather look upon this as an Effect of ſuch a Diſeaſe than the Cauſe, as I find *M. Maloet* does in the Memoirs of the *French* Academy of Sciences for the Year 1728.

As I have been Witneſs to the greateſt Miſchiefs from ſuch a Diſeaſe, I thought it juſt to obſerve, that it ſhould be plied very earneſtly upon its firſt Appearance; and that the Improvers of our Art ſhould lay them-

themſelves out to ſee if they could fall upon a more certain and expeditious Method of Cure. I am,

Your moſt humble Servant.

St. Andrew's, July 21. 1736.

THOMAS SIMSON.

XXI. *The Hiſtory of an* Ulcer *of the* Leg; *by* ALEXANDER MONRO *Profeſſor of Anatomy in the Univerſity of* Edinburgh.

ALexander *Sheppard* a Smith, aged thirty ſix Years, having accidentally wounded the fore-part of his Leg with the Point of a Hook about the Beginning of Harveſt 1732, an Inflammation and Suppuration were brought on this Member, and were neglected till *October*, when he was received into the Infirmary here.

In examining the State of this diſeaſed Leg, a Sinous Ulcer was diſcovered to extend itſelf the whole Length of the Leg. This being laid open, ſent out only a very ſmall Quantity of ſanious *Ichor*, and in a few Days after, the Knee was attacked with a painful Swelling, which ſoon yield-

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ed to a Fomentation of Urine, in which *Wormwood*, *Camomel* and *Mallows* had been boiled. The Ulcer ſeemed to be in a good Way for ſome Days after this; but then proud ſpongy Fleſh roſe from it, which was kept down by ſprinkling *red præcipitate* upon it; and, in order to correct his bad Habit of Body, he was ordered to drink plentifully the Decoction of *Guajac*, and had repeated Doſes of mercurial Purges given him. Theſe Medicines had a good Effect for ſome Time, but upon interrupting the Uſe of them a little, the Matter of the Ulcer turned more ſanious, he felt a Pain and Stiffneſs in his Knee, Pimples broke out all round the Ulcer of his Leg, and the Itch appeared every where elſe on his Skin. The mercurial Purgatives were therefore repeated, and again brought the Leg to a better Condition, but left a Diarrhœa that continued ſeveral Days.

In the Beginning of *January* 1733, he was ſeized with a feveriſh Paroxyſm like that of an Ague, and next Day a red Swelling of the Eryſipelatous kind was obſerved on the back Part of the diſeaſed Leg near the Ankle.

The Day following the Tumor of the Leg was leſs, but his Knee was conſiderably ſwelled, though without any Heat or Redneſs,

Redneſs, his Pulſe was frequent, with Thirſt, Heat, and other feveriſh Symptoms. A low vegetable Diet was preſcribed, with Emulſion or Milk and Water for his Drink, and emollient Fotuſes and Cataplaſms were applied to his Knee. Notwithſtanding which the feveriſh Symptoms continued, the Knee ſwelled more, and became more painful, and a large Suppuration began in the back Part of his Leg. Theſe were ſoon followed by an obſtinate Diarrhœa; ſo that before the End of this Month *January*, he was emaciated to Skin and Bone, was ſo weak as ſcarce to be able to turn himſelf in his Bed, his Appetite was quite loſt, and he had conſtantly a quick Pulſe and Thirſt, with Night Sweats, and a colliquative Diarrhœa. His Knee was greatly ſwelled, with its Ligaments ſo weak that the Bones could be made to have the Appearance of a partial Luxation, and a certain Grating was felt on moving the *Patella* from one Side to the other; at the ſame Time a large Collection of *Pus* was made in the back Part of the Leg.

He had refuſed to allow the Amputation of his Leg to be made when it was firſt propoſed to him, but finding himſelf worſe every Day, and being convinced that the only Chance he had for Life, was to have

that

that Operation performed, he allowed it to be done on the first Day of *February* by Mr. *Hope*, who was the Surgeon then attending.

The Member was taken off four Inches above the Knee. When this Joint was dissected, the Cartilages were found eroded, and the Bones were become carious.

From the Day of the Operation he had no more Diarrhœa; and in twelve Days after, all the other hectick Symptoms were gone, his Flesh and Strength being evidently recovered considerably.

The Cure went successfully on all the Months of *February* and *March*, except that on *March* 16th, a livid-coloured Spot about the Size of a Sixpence was observed towards the posterior Part of the Wound, which having a Pledgit dipt in Brandy applied to it, could not be seen next dressing.

April 6th, Several *Granula* of Flesh that came out, with very small Peduncles, from the solid Substance of the Bone, threw out a considerable Quantity of Blood, and four or five more such Hæmorrhagies, from these fleshy *Papillæ*, happened in this Month, and were always stopped by applying Oil of Turpentine.

April 12th, A large livid *Fungus* sprouted out from the Cavity of the Bone, and several

ſeveral other ſuch *Fungi* were ſeen on the fleſhy Parts alſo of the Wound. Theſe were removed by repeated Searing with a red-hot Iron, and the Application of Oil of Turpentine.

In the Beginning of *May* he was altogether free from the *Fungi* and Hæmorrhagies, and, *May* 15th, a Piece of the Thigh-bone, about the thickneſs of a Crown, exfoliated.

He was then cured of his Itch; appeared to be every way in good Health and Vigour, with the Bone covered, and all the Wound cicatrized, except about the breadth of half a Crown in the middle moſt prominent Part where the Bone was, on which a Skin could not be brought; and therefore it was neceſſary to contrive ſuch an Inſtrument for him to walk with, as would not allow the Weight of his Body to bear on this raw Part, and that could make the ſoft Parts to ſupport the Body, without reſting on the Bone.

The Inſtrument he made Uſe of with Succeſs was of the Form which you ſee repreſented in the annexed Figure, (See *Tab.* III. *Fig.* 3. and 4.) which I chuſe to ſend you, becauſe if ſuch an one is deſcribed by any Author, his Works are not very generally read in this Country.

A is a Box of Wood made firm on the Outside by two Rings of Iron *a*, *a*, and covered within with a thick twilting of Wool under Chamois-Leather.

B is the Stick or Leg of such a length as answers to the sound Extremity.

A Piece of strong Bend-Leather shaped as in *Fig.* 4. is fixed to the Brim of the Box A, the two Ends CC being at a Distance from each other, and having Py-holes for passing the Lace D through; the middle, long part E has a large Piece of thick Chamois, or thin well-dressed Buff-leather F fixed to it.

G, G is a Belt of Buff, at one end of which is the Buckle H, and the other End I is pierced with Holes for easily passing the Tongues of the Buckle.

K, L are two small Straps coming from the lower Edge of the Belt G.

m, *n* are two small Buckles fastned to the Bend-Leather.

The Patient having the Thigh of his Breeches fitted to his Stump, so that the prominent raw Part, with the Dressings upon it, passes through a Hole left in the End of the Breeches, the Stump is put through the Bend-Leather into the pyramidal Box, which does not allow the raw Part to sink to its Bottom; and the laced Part D is brought

brought to anſwer to the Courſe of the large crural Veſſels on the Inſide of the Thigh: Then the Lace is drawn ſo tight, that the Bend-leather may grip the Thigh all round, by which the whole Weight will not reſt upon the Cicatrix of the Stump on the Sides of the Box; but the Teguments of the Thigh all bear a Share, while the tight lacing will have no bad Effect in ſtopping the Circulation, the larger Veſſels being free from any Compreſſion: E comes upon the Outſide of the Thigh as high as the great *Trochanter*, and F covers the *Glutæi* Muſcles; and being pliable, allows them and the Joint to move eaſily. The Belt GG is then faſtned round the Loins, and the Straps K, L are ſecured by the Buckles *m*, *n*, to ſupport the Inſtrument in the Inſide of the Thigh.

If the Belt GG does not ſupport all well enough, a Suſpenſory muſt be put over the Shoulders, to be faſtned to it at two different Parts both before and behind.

Any who read the preceding Hiſtory, and conſider the Nature of the Matter evacuated at the Sinus, its ſmall Quantity, the feveriſh Symptoms coming upon this, Nature's Effort to throw it off by a new Suppuration, and by the Skin where it erodes the Conduits, it could not paſs; and the

Hæmor-

Hæmorrhagies, *Fungi*, &c. that came on afterwards, will observe very strong Marks of a sharp purulent Matter reassumed into the Blood; and from the Success of this Case, Surgeons may be encouraged to undertake Operations to Patients with very unfavourable Symptoms, when they can thereby take away a *fomes purulentus*, or any other Cause upon which the Symptoms depend. That it may not be thought I recommend bold Operations from the Success of this single Instance, I must tell you, that among the small Number which our Infirmary, so lately erected, can maintain, there are several such other Cases recorded. 1. *Patrick Higgins*, fourteen Years of Age, with the Bones of his Leg carious, hectick Fevers, colliquative Sweats and Diarrhœa, was received into the *Infirmary*, *September* 17th 1730, where his Leg was amputated, and went out of it plump and strong, with a firm Cicatrice, 21st *December* thereafter. 2. *Margaret Cleghorn*, hectick, weak and emaciated, with the Bones of the Foot and Leg carious, was admitted 2d *March* 1732, underwent the same Operation, and was perfectly cured. 3. *Isabel Blackader*, whose History I have already related. And analogous to these Cases, I have seen People in much the same Circum-

Fig. 3.

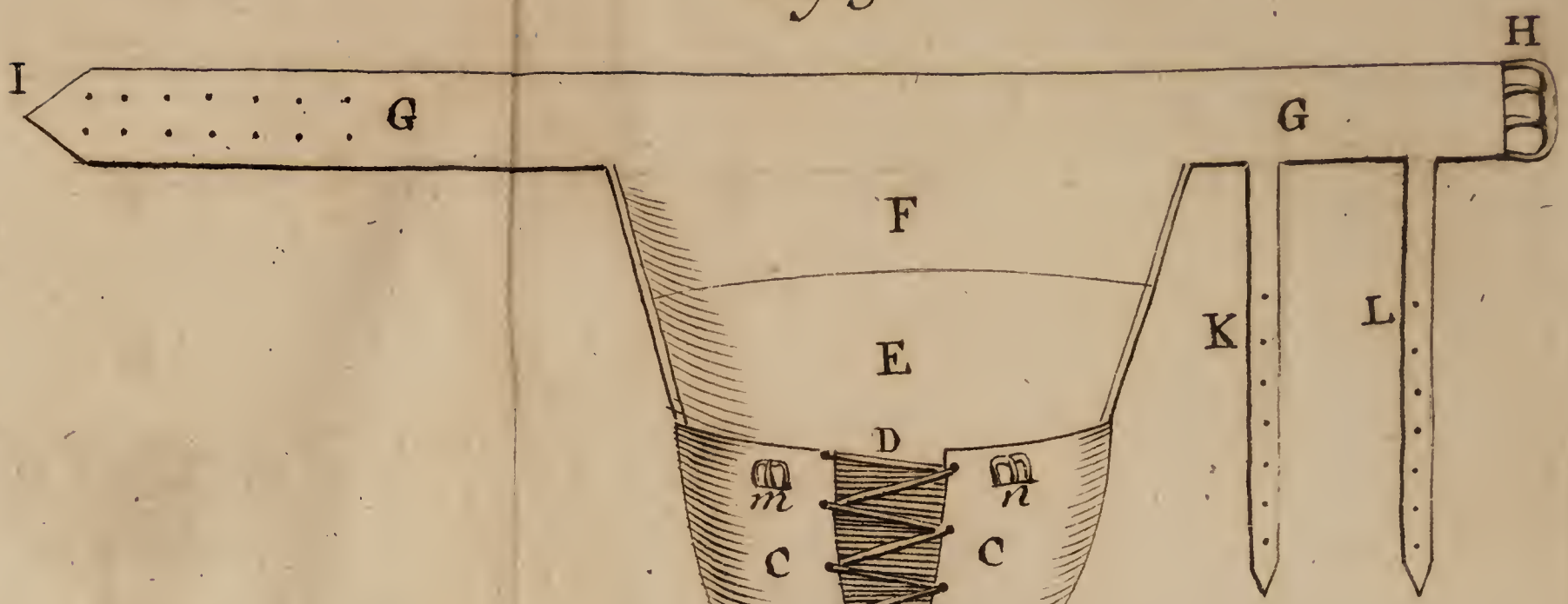


Fig. 1

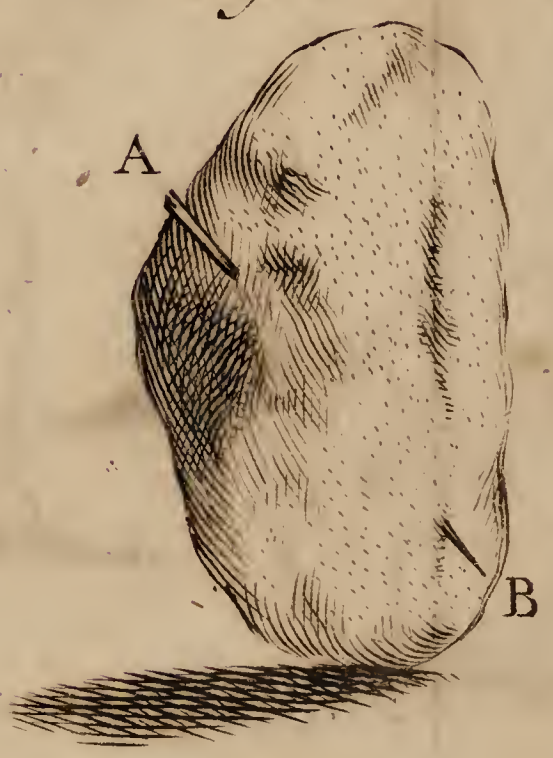


Fig. 2

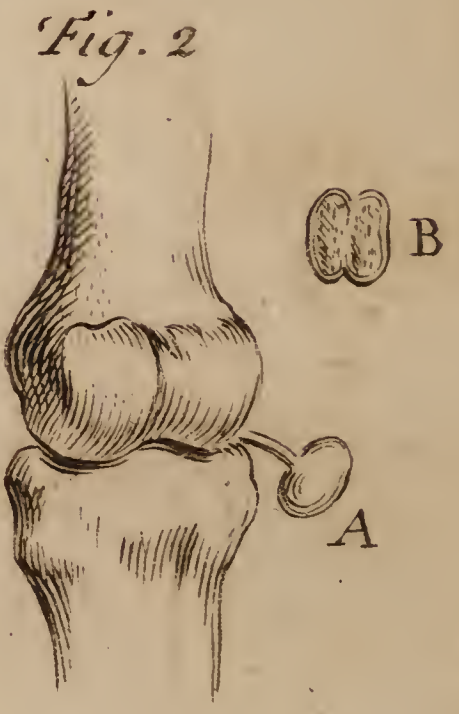
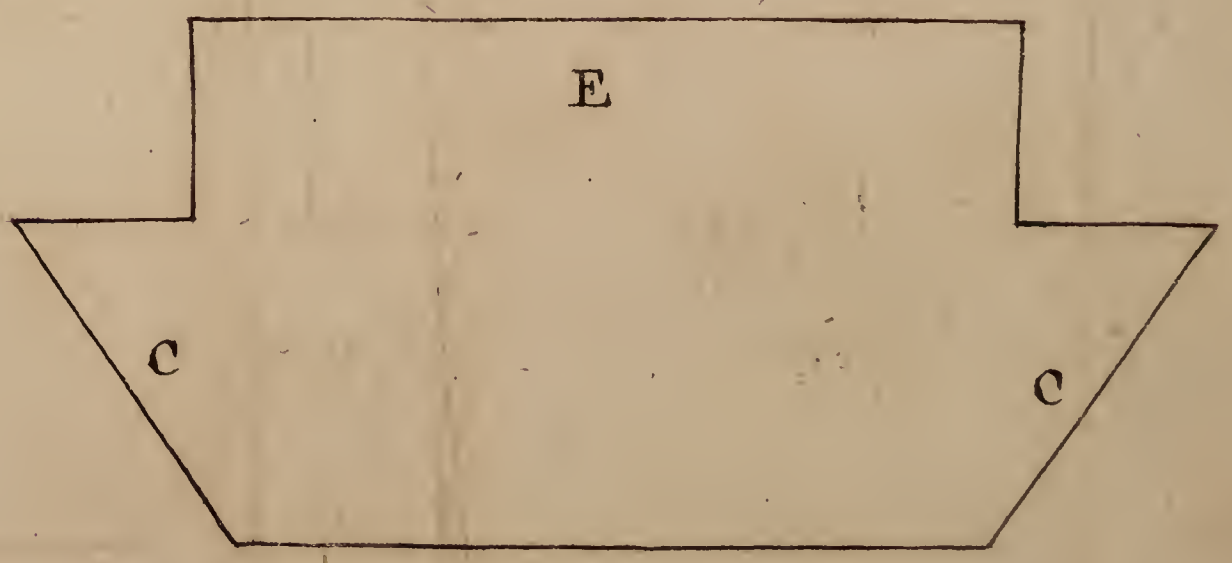
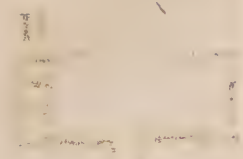


Fig. 4.





Circumſtances from very large ulcerated bleeding *Cancers*, large internal Abſceſſes of the Liver, Kidney, *&c.* who recovered daily after the Amputation of the Cancer, or opening the Abſceſſes.

XXII. *Remarks on the* Amputations *of the larger* Extremities; *by* the ſame.

IN the Operations of Surgery there are a Number of little Circumſtances, ſeveral of which ſeem at firſt View to be of no great Conſequence; but when their Obſervation or Neglect comes to be attended to in Practice, they are found to contribute conſiderably to a ſpeedy or tedious Cure, to bring on or prevent bad Symptoms, to keep the Patient eaſy, and preſerve him, or to put him to Pain, and bring him into Danger; and therefore their good or bad Effects ought to be duly conſidered, and the proper Cautions concerning them ought to be given by thoſe who write for the Publick upon ſuch Subjects. In which Particular our chirurgical Authors are for moſt part very negligent; as an Example of this, I ſhall make ſome Remarks on the *Amputations of the larger Extremities*, an Opera-

tion, than which there is none of those that are called the greater or more dangerous, more frequently performed, and about which the Directions seem to be very particular, and confirmed by the frequently-repeated Experience of Authors.

This Operation of Amputation consists in a proper Precaution to prevent any Hæmorrhagy during the Operation; cutting all the soft Parts, which cover the Bone or Bones; sawing it or them through; securing the cut Vessels from bleeding afterwards; and dressing, so as to promote a safe and easy Cure. In this Order then I shall make my Remarks.

THE *Precaution taken to prevent a Hæmorrhagy during the Operation*, is by applying *Petit*'s, or the common *Tourniquet*. I shall refer to what the Contriver Mr. *Petit* says (*a*) of the Advantages and Conveniencies of his Instrument, and shall only consider the common one which Surgeons, who generally have not or do not know the other, do commonly make Use of. It consists of a thick Substance, to be placed on the large common Artery of the Member, for compressing it; a circular Compress to be put round the Limb

(*a*) Memoires de l'Acad. des sciences 1718.

Limb, to defend the Teguments; a ſtrong Strap that is to be twiſted; a ſmall Stick with which the twiſting of the Strap is to be made; and a ſmall Piece of Paſteboard or Horn, to allow the twiſting to be made more eaſily, and to defend the Teguments below the twiſted Part from being hurt by it.

Several *French* Authors order a thick Compreſs to be placed over the Artery, for its Compreſſion; but a Roller, which our Surgeons generally uſe, is much preferable; becauſe, as the Arteries ly deep in the Interſtices of Muſcles, between which the compreſſing Subſtance muſt ſink before it can affect the Arteries, this cannot be done near ſo well by the plain Surface of a Compreſs, as by a convex Roller.

The Size of this Roller muſt be proportioned to the Diſtance between the Muſcles, and to the Depth of the Situation of the Artery. If the Roller is too thick, it will be born off from the Artery by the Muſcles; and if it is too ſmall, the Muſcles will hinder the twiſted Ligature to preſs it ſufficiently on the Artery.

Not only muſt the Size of the Roller be regarded, but Care muſt be taken to roll it up of a due Firmneſs: If it is too ſoft, it will have the Fault mentioned of the Compreſs: If it is too hard, it preſſes with too

narrow a Surface, from below which the Artery may slide, and the Circulation may therefore be continued in it, after the Ligature or Strap is fully twisted. One must easily judge that such a Firmness is required in the Roller as allows it to retain its cylindrical Form, till a considerable Force is applied to make it a little flat.

Authors in their Writings, and Surgeons in performing this Operation, are uncertain in the Application of the circular Compress of the Tourniquet; some putting this Compress round the Member, before they place the Roller on the Artery, which may be attended with very bad Consequence: For if it is wrap'd loosely round, it comes to be wrinkled and doubled by the twisted Strap, which both hurts the Skin, and hinders the twisting. If it is put tight round, it keeps off the Roller from sinking between the Muscles, and the Hæmorrhagy is not prevented, as I have seen happen both from this Cause and too hard a Roller. The Roller ought therefore always to be applied first upon the Artery, and then the circular Compress is to be drawn tight over both Roller and Member.

If the Roller and Compress are not sowed to each other, the Roller may sometimes be in hazard of shuffling out from below

low the Compreſs in the Time of the Operation, and for moſt part will do it when the twiſting Strap is left looſe after the Operation, and all the Dreſſings are applied, which may be attended with Danger of Hæmorrhagy during the Operation, and the Surgeon is diſappointed of uſing the Tourniquet ſo quickly as he would wiſh, if any bleeding happens after the Operation. Not only therefore ought the Roller and Compreſs to be ſowed together, but the Ends of the Compreſs ought to be ſo ſecured that it may not fall off.

I have nothing to remark on the common Directions for the Strap, Paſteboard, Twiſting-ſtick and the Twiſting, unleſs to take care that the Strap is ſtrong enough, and no way worn, leſt it break, and the Veſſels are let looſe upon the Operator in the Middle of the Operation. If ſuch an Accident ſhould happen, the Surgeon had need to keep his Preſence of Mind, which if he does, there will be no great Danger; for an Aſſiſtant may ſupply the want of the Tourniquet, by gripping the Roller firmly, till either a new Strap is provided, or rather till the Surgeon has finiſhed the Operation, which it is his Buſineſs to do, in ſuch Circumſtances, as quickly as he can. Nay, though there is no ſuch Aſſiſtant, the Sur-

geon, by sawing the Bones through very quickly, and then putting his Fingers on the large Arteries, till he has brought the Stitches round them with the other Hand, may prevent too great a Loss of Blood.

In *cutting the soft Parts which cover the Bones*, all Care should be taken to have the Skin and Bone as equal with the Surface of the Wound in the Muscles as possible; for if the Skin is retracted much in the Circumference of the Wound, and the Bone jets out far in the Middle, a tedious Cure is to be expected. For this Purpose the Skin is not only to be drawn firmly up, while the Fillet, which is put immediately above where the circular Incision is to be made, is applied tightly; but the Assistant who holds the upper Extremity of the Member, is to draw the Skin, and, if he can, the Muscles too, as tightly as possible, both to save them, and to keep them tense, by which they cut much more easily. And the Operator is not only previously to cut the Skin round, and then to make the circular Incision of the Muscles close by its upper cut Edge in the Thigh, and other Places where a strong Retraction of the soft Parts is expected, as is recommended by some late *French* Writers; but after cutting the *Periosteum* round, as near to the

Flesh

Fleſh as poſſible, he is to ſcrape it upwards with the Edge of his Knife, by which the Side of the Blade muſt puſh upwards the Muſcles which are next to the Bone, and which retract leaſt, becauſe of their Connection to the Bone; ſo that the Bone being ſawed near to the Fleſh, the whole Surface of the Stump may be plain, without any pyramidal Prominence in the Middle, which not only protracts the Cure, by its larger Surface and Diſtance of the Skin from the Bone, but is a great Inconvenience to the Patient ever after, by the Prominence being perpetually galled with every thing that preſſes on it.

BEFORE *the Saw is to be applied*, a Piece of ſlit Linen is always ordered to be put round the Bone, wherewith the ſoft Parts may be drawn up and defended from the Teeth of the Saw. I have almoſt always ſeen one of two Inconveniencies happen from this Piece of Linen; either the Surgeon applied his Saw ſo cloſe to it, that the Linen was engaged in the Teeth of the Saw, which made it impracticable for the Surgeon to go on in ſawing, till it was diſengaged; or elſe to ſhun this, he left too much of the Bone without the Fleſh, with a greater Chance of a tedious Exfoliation, and a Certainty of a pyramidal Stump. This Li-

nen ought either not to be applied, from the want of which I never saw any Inconvenience, or it ought not to be allowed to touch the Bone, that the Surgeon may be at Liberty to apply his Saw upon the Bone close enough to the Flesh.

The common Directions are sufficient for the Sawing.

To *secure the cut Vessels from bleeding*, the most common Practice is now to stitch the Vessels; for Astringents and other Stypticks are found altogether insufficient in such Amputations as I now treat of. Caustick are both uncertain, and destroy more than is necessary. Compression by common Bandages cannot restrain the Hæmorrhagy, and Mr. *Petit*'s new compressing Machine (*a*), if it is to be depended on, to stop the bleeding of Arteries in the muscular Part of the Thigh, at a Distance from any Bone; or if it can be applied to that Artery of the Leg which lies close to the Side of the *Fibula*, where it pierces through the Ligament between the Bones, will be long before it is in the Possession of most Surgeons. The Stitching then is only what I will consider.

The Form of the Needles employed here, and

(*a*) Memoires de l'Acad. des sciences 1731.

and the way of making a thin flat Ribband, by waxing a Number of ſmall Threads together for tying the Veſſels, inſtead of the common round Threads formerly uſed, are now too well known to be inſiſted on.

In puſhing the Needle round the Artery, the Surgeon ſhould be careful to carry it, within the Subſtance he pierces, two Thirds or three Fourths of the Circumference of the Artery; for if the Thread is only lodged within the Fleſh of one half or leſs of that Circumference, the Artery may be miſſed altogether in drawing the Ligature, or ſuch a ſmall Part of one Side of the Extremity of the Artery may be taken into the Nooſe of the Knot, that it will eaſily ſlide off; and though the Bleeding appears ſufficiently guarded againſt at firſt, yet a freſh Hæmorrhagy begins ſoon after. I remember once to have ſeen this Accident occaſioned in the Manner now deſcribed.

In paſſing the Needle thus, as few muſcular Fibres, Tendons or Ligaments ought to be taken within the Nooſe as poſſible, but the Surgeon ſhould attempt to thruſt his Needle only through the cellular Subſtance in which the Arteries of the Extremities ly: For the Threads when drawn have greater Effect in bringing the Sides of the Artery together, when the Subſtance

ſtance comprehended in the Nooſe is ſoft and thin, than when it is firm and thick; leſs Pain is given by ſhunning the nervous Parts, leſs Subſtance is loſt when the tyed Parts fall off, and there is no ſuch Danger of the Stitches being ſo long in caſting off, and conſequently of the new Fleſh growing over the Knots ſo far, that they are ſcarce to be come at to cut them away, without Danger of opening the Artery again; or by leaving the Stitches, ſinous Ulcers are formed in the Stump, and no Cure can be made. I have more than once ſeen all thoſe Inconveniencies, from more than was neceſſary being taken into the Nooſe of the Thread in ſtitching Arteries. This which I look on as a hurtful Practice, has ſome Reaſons to ſupport it, which has brought People into the Exerciſe of it, ſuch is the Fear they have of the Thread's cutting the Coats of the Artery in tying, unleſs ſome other firm Subſtance is taken in. But this none who makes Uſe of ſuch flat Thread as I mentioned, and has been the leaſt accuſtomed to make ſuch Ligatures, is in any Danger of; nay, it is not in any one's Power to cut the Coats of an Artery with ſuch Thread, by the ſole Force of Tying; indeed by pulling outwards at the ſame time he makes the Ligature, the Surgeon

may

may tear the Artery, but this every Surgeon guards againſt. Next, it may be ſaid in Defence of comprehending the firmer ſurrounding Parts within the Nooſe, that otherwiſe the Ligature may be puſhed by the Force of the Blood over the Extremity of the Artery: But this will be found to be without Foundation too; for as ſoon as the Ligature is made, the cellular Subſtance beyond the Stitch, having ſtill a Communication with the ſurrounding Cells, ſwells and turns firmer and harder, ſo as to prevent the Thread from ſliding.

That Fear of cutting the Coats of Arteries in tying the Threads, makes Surgeons frequently tye them too looſe; if the Blood is ſtopt, they require no more. But they ought to conſider, That Threads tying Arteries only come away afterwards, by the tyed Parts mortifying or ſuppurating away, and that the ſooner ſuch Corruption is brought on (which will be exactly in Proportion to the Tightneſs of the Ligatures) the Separation of the Threads will be the more ſpeedy. The Rule therefore will be, that where the Artery is very large, and conſequently where the Plug of coagulated Blood obſtructing its Orifice, the firm Concretion of its Sides, the new ſprouting Fleſh or whatever elſe it is that blocks up its Orifice,

fice, muſt be longer in forming, the Ligature is not to be ſo very tight, that its Separation may be longer in making, and all Hazard of Hæmorrhagy may be ſhunned. But where the Artery is not large, the tighter the Threads are drawn, ſo much the better, that they may ſooner fall off, and the Cure may be more ſpeedy.

It may be eaſily judged from what has been ſaid, that the Compreſs of Linen recommended by ſome Authors to be put between one Side of the Artery and the Nooſe of the Thread, cannot be approved; the Effects of it being to prevent the tight enough Ligature of the Veſſel; and if it ſhould ſhuffle out ſoon, a Hæmorrhagy muſt be expected; or, if it remains, the *Pus* which it imbibes will become too acrid.

After the two Knots are made on the Ligatures of the Veſſels, ſeveral Writers recommend the Thread's being left of ſuch a Length, as to turn over on the Side of the Stump; but when this is done, the Blood or Matter which comes from the Wound, never fails to glue thoſe Threads ſo firmly to the other Dreſſings, that theſe can ſcarce be brought off without the Threads being pulled more or leſs, which endangers the tearing the Extremities of the Arteries, or making the Threads ſlide over them, to occa-

occaſion a Hæmorrhagy; whereas, by leaving the Threads ſo ſhort that they can ſcarce reach to the Edge of the Wound, they are always kept moiſt, and ſo cannot adhere to the Dreſſings, to run that risk.

In Amputations, the Surgeon ought not to content himſelf with tying only ſuch Veſſels as he obſerves throwing out Blood, while the Patient is faint with the Pain, but he ſhould endeavour to rouſe him from that faintiſh State by a Cordial, and then wiping off the coagulated Blood with a Sponge wet in warm Water, he ſhould examine narrowly all the Surface of the Stump, to diſcover the bubbling Streams, to ſecure them before the Dreſſings are put on, otherwiſe he may expect to be obliged by a freſh Hæmorrhagy to undo all.

At firſt *Dreſſing*, Surgeons uſe to be very anxious about the Bleeding, and for that Reaſon applied great Quantities of aſtringent Powders: but theſe were obſerved to purſe up the ſmall Veſſels too much, and thereby to retard the Suppuration; while by the hard Cake which they form, they gall the Wound, and cannot be taken off without much Difficulty and Pain, and therefore they have been long diſuſed in this Country. In place of which Pledgits wet with hot *Oil of Turpentine* were applied: This

This gave very ſharp pain, and by it ſometimes there is Hazard of bringing on a Hæmorrhagy at its firſt Application, afterwards it hardens the Veſſels and reſiſts the Suppuration, and never miſſes to ſcald and bliſter the Skin round the Stump, and thus creates ſuch Pain as the Patient complains more of than he does of the Wound. If the larger Veſſels are well tied, and no Fault is committed in applying the other Dreſſings, there is occaſion for no other Application to the Wound than the Threads of ſoft half-worn Linen, which the *French* call *Charpie*, the *Engliſh*, *Lint*, and we *Caddiſs*, which is a gentle Abſorbent, is ſoft and eaſy to the Wound, and by the corrupting Liquors it imbibes, proves one of the ſtrongeſt, moſt mild and ſafe Suppuratives.

Great Pains were commonly taken to form the Lint into neat Pledgits before it was applied, but it is impoſſible to make Pledgits without folding the Extremities of the Threads where it becomes thicker and harder, and ſo makes an unequal Preſſure, which produces ſeveral ill Effects. I have often ſeen Wounds changed to the worſe, by the unequal Compreſſion of Pledgits, Compreſſes and Bandages of one Dreſſing. In order to ſhun theſe Inconveniencies, the Lint needs only to be laid into thin

thin Parcels, as is done when Pledgits are to be made; with theſe the Inequalities between Bones or elſewhere can be perfectly well filled up, and an equal ſoft Compreſſion can be made on the whole Surface of any broad Wound or Ulcer; in all which the Lint ought always to be applied in the Form juſt now mentioned.

This Way of Dreſſing makes, you ſee, the Compreſſes that are commonly deſired to be put on the Extremities of the Arteries, and the particular Pledgits for the Bones altogether unneceſſary.

The *Malta* Compreſs is pretty well contrived, though it would be better to have a Cap of Woollen, or ſome ſuch Subſtance, that would contain the Stump, without any Part being doubled or folding over another, as muſt be done with the Angles of the *Malta* Compreſs, which therefore make an unequal Preſſure on the Parts of the Skin they are applied to. The two long Compreſſes that are ordered to be applied croſs the Stump upon the *Malta*, ſeem unneceſſary, if not hurtful; for being made to croſs on the middle moſt prominent Part of the Dreſſing, they preſs only the Bone, which anſwers no Purpoſe, and they hinder the equal Compreſſion which ought to be made by the Bandage on the other Parts of the Wound.

Wound. At the ſame Time, the Ends of theſe Compreſſes which are laid upwards on the Member, bruiſe and gall the Skin when the Bandage is applied tight upon them. I have ſeen them ſunk their whole Thickneſs into the Skin. It will be ſufficient to place a narrow thick Compreſs on the Courſe of the large Artery, to moderate the Courſe of the Blood in it, or rather this may be done by croſſing the Extremities of the circular Compreſs, which is put round the Member, upon the Artery.

Notwithſtanding all the effectual Methods we now have for preventing a Hæmorrhagy in Amputations, Surgeons ſtill continue to act as if they were as much afraid of it as they had Reaſon before either *Tourniquet* or *Stitching* were known, and by this do ſeveral hurtful Things; among the reſt, the too tight Application of the Bandage upon the other Dreſſings, is one: If the Circulation is not intirely ſtopped, and a Mortification brought on by it, they think it cannot be too tight. But beſides this Hazard of Mortification, there are ſeveral Diſadvantages which they are expoſed to by this Practice, whereof the very Thing they are afraid of, the Hæmorrhagy is one, as I ſhall endeavour to demonſtrate, in conſidering the Effects of the different

Turns

Turns of the Amputation-Bandage applied tightly.

The longitudinal Turns of the Bandage which are made to pass over the Middle of the Stump in different Directions, to cover it all over, exert their greatest Power against that middle Part where the Bone is, which bears off their Pressure from the other Parts, and the large Arteries which shrink up farther than the Extremity of the Bone, cannot be affected by their Pressure. If this middle Part is shunned in making the longitudinal Turns, the Flesh only is pressed, and therefore will be thrust upwards from the Bone which is left prominent and bare, to occasion a tedious Cure, and at last a pyramidal Stump, which is always after uneasy to the Patient. The immediate Effect of too great Pressure on the soft Parts, is to hinder the small Vessels to discharge themselves, which creates Pain and Inflammation, and does not allow the Suppuration to come on. I had Occasion to see this prettily confirmed in the Case of one *James Spence*, who had the Amputation performed in the Middle of the Fore-arm, in the Infirmary here. By changing the Posture of the Fore-arm soon after the Operation, he had made the longitudinal Turns, which went also round the Elbow, tighter

than they were at first applied. Three Days after, there was not the least Appearance of *Ichor* coming through the Dressings, nor any suppurating Smell, his Pulse became quick, and he complained of Pain, Throbbing and Girding in the Stump. I judged what was the Cause, and cut all the longitudinal Turns at the Elbow; in few Hours after, his Complaints were all gone, the exterior Dressings were stained with the Liquor ouzing through them; next Day all the Symptoms of a mild plentiful Suppuration were seen, and the Cure was soon compleated.

The circular Turns of the Bandage when tight, must stop the Return of the Blood in the cutaneous Veins, and by making thus a greater Resistance to the Blood in the Arteries which anastomose with them, will occasion the contracting Power of the Heart and Arteries to dilate and force more Blood into their other Branches; but these being cut in the Amputation, will pour out their Blood, and so a Hæmorrhagy is brought on. Analogous to this it is, that when a Ligature is put round the Arm or Leg, it becomes all red below, the lateral Branches having much more Blood thrown then into them than they had when the Circulation was free. It can be to this Cause only, that a Phænomenon,

non, which ſurpriſes many Surgeons, is owing, to wit, after dreſſing a Wound according to Art, it bleeds; upon taking off all the Dreſſings, not a Drop comes out: If the Surgeon wiſely thinks to prevent any further Blooding, by ſtill a tighter Bandage, the Hæmorrhagy is greater, unleſs he will chuſe to risk a Mortification. To ſatisfy ſome Gentlemen fully of the Truth I argue for, I took the Management of a *Tourniquet* while the Amputation of a Thigh was performing; after the large Arteries were all ſtitched, I let looſe the *Tourniquet*, ſcarce any Drops of Blood fell from the Stump. I then gradually twiſted the *Tourniquet*; whenever it became a little tight, the whole Surface of the Wound ſeem'd ouzing Orifices of Veſſels. I twiſted it again fully, and ſtopt them all; then untwiſting gradually, ſhewed them the ſame bubbling Scene, till the *Tourniquet* was quite looſe, when no more Blood came.

From the whole I would conclude, that no more is required of the Bandage than to preſs the other Dreſſings very gently to the Wound. If a Surgeon is to fall into any of the Extremes of too looſe or too tight Bandage, the former will, in my Opinion, do much leſs Harm than the latter.

Our *Britiſh* Surgeons would do well not

to be so free in Blood-letting as the *French* Operators direct. I shall not now examine whether the *French* Constitutions require this Evacuation more than we do; or whether so frequent and plentiful Evacuations of Blood is a faulty Practice among them, introduced at first by a mistaken Theory, and prevailing afterwards by Custom: But this is certain, that though Blooding is exceeding necessary in plethorick Habits that undergo the Amputation, and is the grand Remedy when Fever and Inflammation seize a Patient after this Operation, it is by no means a general Rule, that all who suffer Amputations should be let blood of either before or after the Operation; for I have in many Instances seen the Cure performed without one bad Accident, when the Patient has scarce lost two Ounces of Blood in the Operation, and was neither blooded before nor after it: And on the contrary, I have observed in the Hospitals at *Paris* and elsewhere, People sink under the Loss of Blood, dying with oedematous Swellings in several Parts.

What I find has induced Practisers to imagine, that in Amputations there was a greater Necessity of letting Blood than in other Wounds of equal Extent with the Stump, is their supposing that immediately upon

upon a Limb's being taken off, the remaining Arteries of the Body are obliged to circulate the Quantity of Blood they contained before, with the Addition of what was ſent to the amputated Member; which additional Quantity they pretend to relieve them of by Venæſection: But when it is conſidered that the amputated Member takes away its Proportion of the Liquors of the Body with it, and therefore leaves no more in the other Veſſels than they contained before, the Reaſon for this Practice muſt ceaſe. For ſome Days after the Operation, the Patient is always kept on a ſpare low Diet, to prevent any Fullneſs, and conſequently there is no Occaſion for blooding in the firſt Days after an Amputation, on account only of any *Plethora* the Loſs of a Limb can be ſuppoſed to bring on. Afterwards indeed when the Patient comes to recover his Appetite, and a fuller Diet is allowed, it is reaſonable to think a *Plethora* may be brought on by the *chylopoietick Viſcera* preparing a greater Quantity of Chyle to be mixed with the Blood, whoſe Veſſels will be too much crowded, becauſe of the Want of thoſe that have been cut off. For which Reaſon it is neceſſary for all who have loſt a large Member, after their Recovery, to uſe a ſpare Diet, or to make frequent

Evacuations, otherwiſe they will probably be ſubject to the plethorick Diſeaſes.

The Caſes then in which Blood-letting is required after Amputation are, when the Patient is of a full Habit of Body, and has loſt little Blood before or in the Time of the Operation, or when there is violent Pain and Swelling in the Member, without being occaſioned by any Application made to the Stump; or when the Pulſe becomes very quick and ſtrong, with Heat, Thirſt, and other feveriſh Symptoms; then indeed Blood-letting, ſuited in Quantity and Repetition to the Symptoms and Strength of the Patient, is abſolutely neceſſary. But if in the firſt three or four Days after the Operation, the Pulſe is only a little more frequent than ordinary, without violent Pain or other bad Symptom, a low Diet, with cooling Drinks and laxative Clyſters, if the Patient is coſtive, will be ſufficient.

The Phyſicians and Surgeons of the *Royal Infirmary* here have always followed the Method above-mentioned, and have not loſt one Patient of fourteen who have had Amputations of the larger Extremities performed.

It is generally too ſoon to take off the firſt Dreſſings on the ſecond, third, or even fourth Day after an Amputation; for they ſtill

ſtill adhere to the Wound, and cannot be brought away without Pain and Bleeding: And there being no ſuch effectual Suppurative as the Liquor ſent out from the Wound, the fifth, ſixth or ſeventh Day is generally ſoon enough for removing the Dreſſings. If the Smell of the *Ichor* of the Wound becomes in the mean time very ſtrong and offenſive to the Patient, it may be neceſſary to cut the Band, and with the Aſſiſtance of Sciſſars to take off the Compreſſes and exterior Part of the Lint, on the third or fourth Day, and to apply clean Things in their Place; but the Lint next to the Wound ought not to be removed, till the Suppuration moiſtens and ſeparates it.

At the ſecond Dreſſing there is no Occaſion for any other Suppurant, than not to be too anxious in cleaning off the Pus that adheres to the Stump, all Moiſture upon the Skin being carefully dried, to prevent Excoriation.

Nothing contributes afterwards more to a ſpeedy Cure than dreſſing ſeldom. The Rule that might be taken from Nature is, to wait till the Patient is ſenſible of an uneaſy itching in the Wound; which ſhews the Pus is beginning to turn acrid, which commonly happens every ſecond or third Day. And as I hinted formerly, an equal gentle

Compreſſion is of great Uſe in keeping up a right Suppuration, and preventing the Growth of ſpungy Fleſh.

If the Threads with which the Arteries were tied ſhould remain too long, (that is, three Weeks or a Month, according to the Largeneſs of the Artery) and the new-ſprouting Fleſh covers the Ligatures, they had beſt be cut out, leſt by the growing of the Fleſh they ſhould become ſo much covered, that they can ſcarce be come at, and ſinuous Ulcers ſhould be formed, to prevent a Cure. The beſt Method of making this Exciſion is, to take hold of the depending Threads, and to introduce a Probe or ſmall Directory along them, till it enters the Nooſe, which is eaſily known, by drawing the Nooſe very cautiouſly outwards with them; for the Reſiſtance which the Thread makes will very plainly be felt. Upon the Probe or Directory, ſlide in one Blade of a Pair of Sciſſars a little opened, till the Point of it is where the other Inſtrument was, and the Point of the other Blade is conſequently on the Outſide of the Nooſe when it is ſnip'd in two, and is eaſily drawn out. In bringing the Threads away in this cautious Manner, there is no Danger of bringing on a Hæmorrhagy from the Artery round which the Thread had been tied; for

long

long before this Time, ſo much of what was taken at firſt into the Nooſe muſt have fallen off, to make it quite looſe, and without any Effect upon the Artery.

If the Patient is of a tolerable Habit of Body, and is managed in the Manner above-deſcribed, dry Lint, and ſometimes touching the ſprouting Fleſh with *Lunar Cauſtic*, are all the Medicines neceſſary towards a compleat Cure, without any Exfoliation of the Bone; which the Surgeon ought to be ſo far from endeavouring to promote, unleſs he ſees the Bone corrupted by ſome Accident or Miſmanagement, that on the contrary it ſhould be his Study how to prevent it. The common Methods for which, as alſo for procuring an Exfoliation, are in my Opinion very faulty: I may poſſibly inform you hereafter of my Reaſons for thinking ſo, and ſhall only juſt now remark, that of the fourteen who ſuffered Amputation in the Infirmary, there was no Exfoliation from any of their Bones, except from the Thigh-bone of *Alexander Sheppard*, whoſe Hiſtory I have already ſent you. In two others, *Iſabel Blackader* and *John Macmillan*, who had the Amputation alſo performed above the Knee, towards the End of their Cure there was a very ſmall Piece or two of Bone obſerved among the Pus; but

but in no other was there any thing like Bone ſeen to come off, though in ſome of them it was thought altogether improbable to prevent ſome Corruption and conſequent Separation of a Part of the Bone, particularly in *Margaret Cleghorn*, whoſe *Tibia* and *Fibula* were ſo ſpongy at the Place of Amputation below the Knee, that had their Condition been known before, the Knife might have been made to cut them through, as well as the Teguments and Muſcles. Notwithſtanding which, and a bad hectick Habit of Body, both Bones were quite covered with Fleſh at the third or fourth Dreſſing, the Wound healed ſoon, and the Cicatrice has remained now firm ſeveral Years.

In theſe Remarks on Amputations, I have blended the Rules of Management ſo with the Reaſoning, that ſeveral Readers will not at firſt have a full orderly View of all the Steps to be taken in performing this Operation after the Manner I have propoſed; nor do I deſign to ſum up the *Agenda*, on purpoſe that thoſe who have moſt Need of Rules, I mean the young Surgeons, may have them more firmly fixed in their Memories, by taking the Trouble to compare what they read in the Books of chirurgical Operations with what has been ſaid here,

and

and then to form for themselves a compleat Description of the whole Operation and Method of Cure, by following the Order I have done, but supplying from their Books what is here superficially passed over as being common, and changing the ordinary Directions for such of mine as they shall think reasonable and confirmed by Practice.

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would allow but of one general Cauſe of Fevers. Though *Obſtruction* may be frequently the Cauſe, I believe it is ſometimes more an Effect than a Cauſe. But Obſtruction does not give a compleat Notion of the Diſeaſe; nor by it alone will we be able to conceive juſtly the Method of Cure. The Part principally obſtructed, the Nature of the obſtructing Matter, and ſeveral other Circumſtances muſt be well conſidered. It is not eaſy to ſay whether it be certain *Miaſmata*, Diſproportion of Parts, particular Acrimony, Exaltation of ſome of the Principles of the Blood, or undue Attraction of them, that occaſions this diſorderly Motion. And as amongſt ſo many different Opinions we are left in Uncertainty, in order to be ſatisfied as to the Cauſe of this, or any other Diſtemper, we are obliged at laſt to truſt to our own Senſes and Reaſon.

This kind of *Fever* I would ſpeak of, has been theſe many Years fatal in *Britain*. I ſhall not account for its Frequency, how far it may be owing to the Manner of living, and a long Courſe of warm and rainy Seaſons. It would be but an unſatisfactory Piece of Theory perhaps, to ſhew how theſe Cauſes bring on ſuch a State of the Fluids as is obſerved, or may be juſtly ſuſpected in this Fever.

For

For a Hiſtory of the Diſeaſe, I incline to give a Deſcription of it, as it had different Appearances in different Perſons. Young People generally complained of Pains or Stitches the firſt Days; by which I have been deceived, taking the Caſe ſometimes for a ſlight Rheumatiſm. Their Complaints otherwiſe were but few. The Pulſe was not much different from natural. Their Sleep was pretty natural, and the Sickneſs was rather Heavineſs, with ſome Degree of Faintneſs. Under ſuch moderate Symptoms I have been ſecure, till a *Delirium*, or Signs of it, ſhewed the Danger: And thoſe who ſeemed to be in no Danger the firſt Days, for moſt part died.

In others the Seizure and Symptoms, the firſt Days, were more violent. They had Vomiting or *Nauſea*, Headach, full, ſtrong or hard Pulſe, Heat and Thirſt, Redneſs of the Eyes. The Caſe then having a good deal of Inflammation in it, it was neceſſary to bleed once and again; and the Symptoms were conſiderably leſſened by it. This did not always happen: But by the time that a *Delirium* came on, the Signs of Inflammation were much abated, the Pulſe was low and contracted, the Heat moderate, and they were altogether as thoſe who in the Seizure had but ſmall Signs of Inflammation, were

not

not bleeded, nor indeed would bear it.

Sometimes they would languish two or three Weeks, before the Disease formed into a Fever; and it stole on so insensibly, that they were in Danger before we were aware. In this Case there was no reckoning of Days, for it was not known when they were seized. In short, as to the manner of Seizure, there was great Difference, but the Disease in the Progress and Height was always the same.

When the first Symptoms were over, an obstinate *Delirium* came on, sooner or later, for most Part very early. Sometimes there was Looseness, with Pains of the Belly; partial Sweats, which gave no Relief; tickling Cough, and more or less of Faintness. Soon after a *Delirium* came on, the mortal Symptoms appeared. In some the *Delirium* did not come to such a Height as in others, nor was it constant; but at times they would talk reasonably, even when a *Subsultus* was upon them. These lay much dispirited, and wasted fast, without any, or but very little increased Evacuation. In some such I have observed a fatty Pellicle upon the Urine. Continual, cold, clammy Sweats are sometimes observed: At other times they, as it were, melt with profuse Sweats, as if Water were sprinkled upon them,

them, and the Skin feels Death-cold.

I have only taken Notice of the more obvious Appearances and remarkable Differences of Symptoms; not needing to make a nice Enumeration of them to one who has ſo often obſerved them.

It was the poorer ſort, and thoſe a Degree above them, who were ſubject to this Fever. I knew but few Inſtances of it amongſt thoſe who lived well; and of Wine-drinkers, I do not remember that there was one ſeized.

Though I am not for multiplying Cauſes in this, or any other Diſtemper, I would here ſuppoſe two very different States of the Fluids: A Sizyneſs or rheumatick *Lentor* of the Blood, tending more or leſs to Inflammation; and a too great Diſſolution of it: Of which we have ſome Notion, when it is ſaid the Blood is poor, vapid, effœte. It was from the firſt of theſe that the Fever with us generally proceeded, and it is in this View that I deſign to conſider it: For when *Bleeding* was neceſſary, we almoſt always found the Cruſt at Top more or leſs tough and compact; and when we durſt not bleed, the Symptoms gave Signs of this *Lentor*. The Tongue was for moſt part only white and moiſt, ſeldom very dry, black or chapt; which argues neither Ardency

dency nor Defect of the Fluids. The Urine was much like that in Health, sometimes redder; a thin, mealy, dusky Sediment was mostly observed, or a thick Cloud falling to the Bottom. A *Crisis* was not to be judged of by the Urine.

This Want of a natural Sediment may be owing to different Causes, depending upon the different Thickness and Velocities of the Blood. In ardent, sanguineous, inflammatory Fevers, where the Blood's Motion is much increased, the Attrition is great, and the several Parts of the Blood are beat down, and so blended together, that in the Urine the different Principles remain confused, and never attract or separate. So likewise when the Fluids are thick, and there is but a small Increase of the Velocity, the watery Parts only will be separated by Urine; while the more solid of Oil, Salt and Earth, will be wrapt up and closely retained: Hence we do not meet with a Sediment. And this makes a large Flux of Urine, profuse Sweats, or increased Looseness, of bad Prognostick in this Fever.

This sizy State of the Blood is attended with more or less of Inflammation, as appears from the different Manners of Seizure. The more Tendency there is to Inflammation, the greater is the Danger. On the con-

contrary, the Hazard is leſs as the Diſeaſe is farther removed from it, till there is Reaſon to think that the *Lentor* is in ſo ſmall a Degree as not to be the Cauſe of the Fever; but that the oppoſite State of the Blood, *viz.* ſome Degree of Diſſolution, is to be ſuſpected, and then the Danger grows in proportion on the other hand. You ſee that to maintain the Suppoſition of two different States of the Blood, and that one or other of them is always the Cauſe of the Fever, I have fancied different Degrees of the morbifick Cauſe, alledging that when we come to the laſt or ſmalleſt Degree of Viſcidity, the firſt or ſmalleſt Degree of Diſſolution begins.

Theſe different Degrees of Sizineſs cannot be better conceived, than by obſerving them in other Diſeaſes. In *Pleuriſies* of the inflammatory kind, we find it in the higheſt Degree; and the moſt cooling, diluting, attenuating Method is little enough to diſſolve it. We meet with it again of a middle Degree, in *Pleuriſies* of the *cold kind*, that have ſomething in them a-kin to a *Peripneumonia notha*: A Method very different from what is uſed in the former, muſt be followed here. The more we evacuate, the Diſeaſe continues longer, and the Stitch is more fixed. So that the very vul-

gar Rule, to bleed till the Cruſt diſappear, or the Blood turn better, as they ſay, is very hurtful. But once bleeding, more or leſs, according to Symptoms, and giving volatile attenuating Things, with proper Diluents, and ſometimes Bliſtering, anſwer all Intentions. This *Lentor* is found in chronical Caſes, where it has little or no Tendency to Inflammation, and therefore is leſs apt to produce Obſtruction or Fever.

How a *Lentor*, which of itſelf appears to be unactive, ſhould excite a Fever, I ſhall not take up your Time to explain; but I am of Opinion that it is this, which, according to the Seaſon, manner of living and Conſtitution of the Perſon, produces Fevers continual and intermittent, Pleuriſies, Rheumatiſms, and other Diſeaſes, retaining to thoſe of the inflammatory Kind, but that do not come fully up to their Nature. If we conſider the Likeneſs and Complication of Symptoms in theſe Diſtempers, and how readily one of them is changed into another; for Inſtance, continual Fevers into intermittent, *& vice verſâ*; as alſo, thoſe of a good kind into malignant: If we conſider theſe, I ſay, we will have ſome Reaſon to think that the Cauſe is much the ſame in them all.

I have ſaid that this *Lentor* is unactive; but

but then it is eaſily put into Motion, or ſo diſpoſed as to produce any of theſe Diſeaſes. By an Error in the *Non-naturals* it may be thrown upon ſome particular Part, or ſo fixed as to excite the Fever. This gives us the moſt ſimple Idea of the Diſeaſe, and is the moſt favourable kind of it, which will have ſeveral Degrees as the *Lentor* is more or leſs compact. We have another Idea of it, when it acquires an inflammatory Diſpoſition, and the Diſeaſe will have different Appearances. When it is joined to a particular Acrimony, we have ſtill another and very different Notion of it.

To determine the ſeveral Kinds of this Fever, the Degrees of it, and the Malignancy with which it may be attended, a Scheme might be made out in this Manner: Fever from a Lentor ——— Lentor and Inflammation ——— Lentor and Acrimony ——— Lentor, Inflammation and Acrimony ——— 1, 2, 3, Degree of Lentor, Inflammation, Acrimony; and ſo on in the Diviſion and Subdiviſion, if you pleaſe, of theſe: Which, according to the various Modifications of Matter in Fevers, and Combination of Cauſes, might be run out to a good length; more for Amuſement, I own, than any real Advantage in Practice.

What happens in other Fevers, deſerves

to be particularly taken notice of in this. I do not know how to call it, a *muſcular Tenſion*, or *univerſal Spaſm*; which does not appear ſo evidently as in Fevers that have more of Inflammation in them, but we may be very ſenſible of it from Effects. This *Lentor* and a *Spaſm* conſequent of it, eſſentially conſtitute the Fever: And all that is done in the Method of Cure has, or ought to have a Relation to one or other, or both of theſe.

As I make frequent Uſe of the Word *Spaſm*, it ſhould be explained. Every Effort of Nature to free herſelf of what is hurtful, is really a *Spaſm*; which will be more or leſs violent, according to the Nature or Force of the ſtimulating Cauſe; and with which more or fewer Parts, according to the Nature of the Diſeaſe, are obſerved to labour. What are *Tremblings*, *Horrors*, *Rigors* in the Attack of Fevers, but a *Spaſm* of the whole Body? What are Headach, Vomiting, Looſeneſs, and all diſorderly Secretions and Excretions, but a *Spaſm* of ſome particular Parts, or Effects of a more univerſal *Spaſm*? The ſame are all theſe Miſchiefs that follow upon a wrong Adminiſtration of Medicines; ſuch as, Increaſe of the Fever, Anxiety, contracted or irregular Pulſe, which happen frequently

ly from bliſtering, hot, ſtimulating Medicines, *&c.* Whatever therefore, to ſpeak yet more properly, increaſes too much the *Oſcillations* of the Solids, will be the Cauſe of a *Spaſm.*

One general Obſervation, taken from the Pulſe before and after the *Height* or *Criſis*, will further ſhew what I mean by a *Spaſm*, and what Share it has in this Fever; whether it be reckoned a joint Cauſe or a chief Symptom, for this we know ſometimes requires our greateſt Attention. The Pulſe before the *Height* is felt low, weak, ſmall, hard, irregular, contracted, being always below the Standard. There is a certain increaſed Degree of Circulation neceſſary for Reſolution, Preparation and Expulſion of the Matter of Diſeaſes. As the Fever goes off, or a *Criſis* ſucceeds, the Pulſe becomes full, firm, ſoft and ſtrong; and if it has not theſe Conditions, the Patient hardly recovers, or he ſuffers a Relapſe. This remarkable Change of the Pulſe cannot be well accounted for, but upon the Suppoſition of a *Spaſm*; which abating at the *Height* of the Diſeaſe, gives Room to the Blood to flow equally into all the Veſſels. The quite contrary happens in ſanguineous and inflammatory Fevers, where, before the *State*, the Pulſe is full, hard and ſtrong;

but after, it becomes ſmall, weak, languid. This makes me think that the *Criſes* muſt be explained in a different Manner. If we would ſtill have a clearer Apprehenſion of the Nature of this Diſeaſe, we ſhould ſeparate the *Fever* from the *Delirium*, and conſider them ſingly. Let us imagine a Fever of this kind performing its Courſe, and no *Delirium* attending it. We may ſuppoſe one will bear up a good while under it, even when there are conſiderable Degrees of Malignity, while the ſeveral Functions are performed, or not much leſed, and the Matter is free in the Veſſels, which by repeated Circulations will be at laſt concocted, and the Fever determined.

But when a *Delirium* comes on, there is really a new Diſeaſe formed, not neceſſarily depending upon the Fever, but from a particular Diſpoſition of the Matter of this Fever, more than of any other, to take to the Head. The analogous Symptoms of the *Fever* and *Delirium* conjunctly, will ſerve now to increaſe the Cauſe, or heighten the Appearances of the Fever, beſide the Symptoms peculiar to the *Delirium* itſelf.

The Symptoms in a Head-ach, for ordinary the Forerunner of a *Delirium*, and which we ſhall ſuppoſe to be in the Membranes

branes of the Brains only, are Coldneſs and Trembling, Nauſea and Vomiting, ſtraitning of the Breaſt and *Præcordia*, involuntary Motions of Head and Neck, contracted, irregular and ſometimes intermitting Pulſe. Theſe are all the Effects of a Spaſm. When an Obſtruction is formed in the Brain itſelf, another Set of Symptoms appears. Beſide theſe mentioned, the Functions are not performed, the Faculties are impaired or loſt, the Secretion of a Fluid in the Brain is in ſome meaſure hindred: This occaſions an irregular Diſtribution of Spirits; for while they are not ſecreted into ſome Places at all, they are violently or unequally ſent into others. Hence proceeds all that Variety of unnatural Actions and Motions obſerved in delirious People; Startings, *Subſultus*, Convulſions, which are all greater Degrees of a *Spaſm*. A *Fever* with a *Delirium* muſt be conſidered as a complicated Diſeaſe.

It will help a good deal too, in forming a Judgment of this Fever, if we examine what Proportion the Fluids bear to the containing Veſſels: The Quantity is ſeldom more than the natural, I mean as it is found in a well-conſtituted Body; ſometimes leſs. The Appearance of Fullneſs in the Beginning of the Fever, is rather from

ſome Degree of Inflammation than a *Plethora*. Here then is a *Stricture* of the Veſſels in a collapſed State, or where their Sides are brought nearer together, by which the intervening Fluids are ſtrongly compreſſed. This gives a Notion of it, very different from what we have of a Fever from Fullneſs, where the Sides of the Veſſels are diſtended. The Removal of the *Stricture* in one Caſe, is by plentiful bleeding and cooling; in the other, by relaxing the Veſſels and attenuating, that the Fluids may be made to occupy a larger Space.

Theſe Things conſidered we come to know, how a Fever that in the Seizure appears mild and favourable, may, when a *Delirium* comes on, be equally malignant, as that which has more acute Signs in the Beginning.

Why this Diſeaſe is ſo dangerous, for the ſame Reaſon that Diſeaſes from *Inanition* are more difficult of Cure than thoſe from Repletion.

That a *Delirium* is not to be regarded as meerly a Symptom, and the Removal of it attempted by Means that in general only reſpect the Fever.

Hence likewiſe we account for a weak, low, ſmall, contracted, irregular Pulſe, ſhrinking

ſhrinking of the Solids, and ſudden Appearance of Waſting, when there is no increaſed Evacuation.

And laſtly, we fix the Senſe of Malignity, which ſhould not ſtill be left under the Scandal of being a myſterious or inſignificant Term.

As I take this Fever to be very different in its Nature and Changes from other Fevers, ſo it is leſs ſubject to the Rules in Prognoſticks. Particular Hiſtories ſhould be adduced for Proof and Illuſtration of theſe Things: This might be done, but it would be too tedious.

The ordinary Evacuations in the Beginning are *Bleeding* and *Vomiting*: I do not know that *Purging* has had a Place here, nor for what Reaſon.

We frequently find the Patient under a ſeeming *Plethora*: Though we do bleed, the Symptoms are not always much abated by it; and if we bleed freely, being deceived by this Appearance of a *Plethora*, we do Harm. Indeed in general, I imagine Bleeding ſeldom did much Good; and if great Caution was not uſed, I ſuſpect it was hurtful: But as I was not often called in the Beginning, I am unwilling to pronounce poſitively about it.

We are generally pretty ſure what will be

be the Effects of Blood-letting, but we are not ſo with reſpect to Vomiting; and I am in ſome Doubt whether it be always uſeful here. In this Fever we may expect a *Delirium* pretty ſoon. By the Mechaniſm in vomiting, the Force of the Circulation is ſtrongly determined to the Brain; which at this Time ſhould be diverted from it, leſt a thick, ſizy Blood impacted into the Brain, bring on a *Delirium* ſooner than might otherwiſe happen. There is ſeldom great Danger, where this Symptom does not come on before the ninth Day.

Vomiting has been of a long Time uſeful in Fevers. It is ſaid, that by it Nature is aſſiſted to throw out every thing hurtful, from the Centre to the Circumference, as the Phraſe is. I do not well underſtand this; for however true it may be in eruptive Fevers, where Vomiting is of great Service, I do not ſee what it has to do, upon this Suppoſition, in other Fevers where we know not what is to be expelled, nor when.

In Fevers we ſhould have a Regard to the State of the *primæ viæ*, whether or not the Cauſe of the Diſeaſe be lodged there. For if it ſhould be ſo, by Vomiting we remove Part of this Cauſe, and ſo cut off from the Supply that might be made to the Blood. But though the *Fomes* ſhould not be in the

primæ

primæ viæ, we yet diſcharge all Superfluities, and bring thoſe Paſſages into a right Condition to do their Office during the Courſe of the Diſeaſe, which they could not do, were they left charged with a great deal of groſs Humours and Recrement. Vomiting will be proper upon another Account, as in ſome low Caſes it gives a greater Spring to the Solids, ſtraitens the Veſſels, and keeps the Blood, where it tends to Diſſolution, more compact; and ſo prevents its Stagnation, and hinders the Fluids from running off at a wrong Time and by wrong Outlets, as ſometimes happens in profuſe Sweats, Looſeneſſes, *&c.*

I only make it a Queſtion, whether *Vomiting* be proper in Fevers *caput petentes*: For though by it the Patient may be relieved for ſome Time, by ſuch an Agitation a greater Quantity of Spirits being forced; yet, if the obſtructing *Lentor* be not, in a good meaſure, broken and diſſolved, it will only be driven farther into the Veſſels, or into ſome Series of Veſſels it has not reached, by which a *Delirium* muſt be hurried on.

Notwithſtanding this, what you obſerved to me ſhall have its full Force, That Vomiting is perhaps the quickeſt Mean in our Power of attenuating a *Lentor*, before it

it be cast upon any Part. Perhaps it may do Hurt after it is impacted, by driving it farther; though it is possible, even then, it may contribute to its Attenuation, that is, Coction. I do not pretend to determine in the Affair: But we know that the Coction or Preparation of Humours, to be recirculated with the Blood, or evacuated by some common Outlet, is the Work of Nature, to be performed in a determinate Time, and under certain Conditions: And to assist her at a wrong Time, or by too forcible Means, would be to disconcert her in her more regular and safer Operations. If Vomiting is judged absolutely and constantly necessary, it should not be delayed beyond the first or second Day; for after this I think it hurtful.

But as we are to have Regard to the State of the *primæ viæ*, if Vomiting is not proper, a *Purgative* will perhaps answer all that is intended by it, and do something more than can be expected from a *Vomit*. When a purging Medicine is doing its Part in cleansing the *primæ viæ*, its Effect seems to reach farther. *Purgatives* excite some Degree of a Fever; and, from what frequently happens, we must believe that some Part of them mixes with the Blood. In Rheumatick Cases, whether a-

cute

cute or chronical, they are of great Service. *Sydenham* lays a Streſs upon them in a *Peripneumonia notha.* Some Fevers in the Beginning are of no certain *Type*, which, after other Evacuations, if they were neceſſary, have turned out of a diſtinct Species, upon purging. Thus Agues are every Day brought into Form, and ſometimes carried off. I know it is ſaid, that Purgatives cure Agues, by removing the Cauſe in the *primæ viæ*, where ſome are pleaſed to place it: But this does not hinder the Effect of a Purgative to reach the Blood, where the Cauſe of the Ague may be ſtill, notwithſtanding any thing that has been ſaid to the contrary. And I hope they will not place the Cauſes of ſome other Diſeaſes in the firſt Paſſages, where the Effects of Purgatives are as remarkable as in Agues. Nay, ſome tell us, their Effect goes ſtill farther, to cleanſe the cuticular Ducts, ſo as to favour Eruptions: And 'tis well known that ſome Kinds of Eruptions inflame and turn worſe, upon taking of Purgatives, I mean, during their Operation. Nor will all this appear ſtrange, if we conſider that the ſame Medicine, differently managed, will vomit, purge, paſs off by Urine or Sweat. I need not mention that they are known to compleat an imperfect Criſis, and to promote

or

or aſcertain it, where there are no evident, or but very doubtful Signs of it.

From all this I would alledge, that, in many Caſes, Purgatives are more proper in the beginning of Fevers than Vomits. For while they cleanſe the Stomach and Inteſtines, they ſeem to have a peculiar Virtue to attenuate a ſizy Blood: Beſide that, they make a notable Revulſion from the nobler Parts, upon which the Force of the Diſeaſe ſo readily falls; and all this without that Hurry and Diſturbance, ſo often occaſioned by Vomiting. It is probable that, after Bleeding to a due Quantity when neceſſary, Purgatives timely given would either break the Force of the Diſeaſe, or diſpoſe it to take ſome more favourable Form, as of *remittent* or *intermittent*, or perhaps deſtroy it. I ſhall not aſſure you of this from Practice; it requires more Time than I have had, to bring Conjectures to a Certainty.

One Thing I would not miſs to take notice of here: The Diſtemper ſo mortal amongſt the Cattle in this Country, is a Fever of a particular Kind. I know of no Medicine that has been of much Service, either to prevent or cure it. The moſt ſucceſsful Method to prevent it is, when the Cattle are thought to be infected, or the

Infection

Infection near, to change the Graſs, by which they are purged; and this is the ordinary Effect of new Graſs. We cannot think that it is owing to the particular Qualities of the Graſs as a proper Antidote, that they are preſerved, Graſs being much the ſame every where; but it muſt be from its purging Quality: For if this viſible Effect does not follow, I'm afraid they will not eſcape. This ſuggeſts to us the Uſe of Purgatives in this Diſeaſe of the Cattle, which, amongſt the many Remedies handed about, and ſaid to do Wonders, is ſcarce ever thought of.

Having mentioned this Diſeaſe of the Cattle, a Compariſon might be made betwixt it and ſome Fevers that have affected human Bodies; ſo far as they may be found to procede from the ſame firſt Cauſe, *viz.* the *Air* and *Weather*. For ſome Years the Seaſons have not been orderly. They have been unkindly, as they ſay. Warm open Winters without Froſt, rainy Summers and Harveſts, have been generally complained of. If by theſe a Diſtemperature of the Fluids is brought on, it will be kept up, ſo long as the general Courſe of the Weather is the ſame. We with the Beaſts are under the ſame external Influences from the Air and Seaſons; and the ſame Diſeaſes, near,

will

will be found in human Bodies as Brutes, though ſomewhat different in Appearances; which is not ſtrange, if we conſider that the Beaſts are conſtantly and more immediately expoſed to theſe Influences, their Food being always the ſame, and very different from ours. Some have imagined this Diſeaſe of the Cattle to procede from the great Swarms of Inſects, of the *Clock-kind*, that come in Summer. I ſhall not enter into a Diſpute about this. But the ſame external Cauſes that favour the Increaſe of theſe Inſects, will produce the Diſeaſe amongſt the Cattle, and Diſeaſes of the ſame Kind amongſt Men too. I have juſt taken Notice of this to oppoſe a general Miſtake, of taking for Cauſes of Diſeaſes, Things that are obvious to Senſe, and becauſe they have ſomething uncommon in them; while the Air and Changes of Weather are neglected, which are Cauſes much more powerful and conſtant, and certainly productive of the greateſt Alterations in Bodies, though in an imperceptible Way.

But let us ſuppoſe the Diſeaſe nothing leſſened, nor altered in its Shape, and now a continual Fever; I'm afraid there is a trite Way too much inſiſted in, in treating it, without diſtinguiſhing the Cauſes from whence it may procede. You know the common

common Method, which I have ſome Time been ſcrupulouſly exact in following, without the leaſt Variation, except where a very evident Difference of Symptoms obliged me to alter ſomething in my Way, which yet was not perhaps very material in itſelf, nor well judged as to Time.

The firſt Thing, in the Method of Cure, I take notice of, is *Bliſtering*. As ſoon as a *Fever* is known to be of the *nervous* Kind, a *Bliſter* is laid to the Back, then to the Arms, next to the Legs, laſt of all to the Head, and at the ſame time Cataplaſms are applied to the Feet: Which laſt I have ſeen ſo ill-timed, that they have been but an Hour or two applied, when the Patient, after long Watching and Raving, has ſeemed to fall aſleep, but never awaked again. All this appears very methodical. And every one is now ſo well acquainted with Bliſters, that every body knows when they are to be applied, how many at a Time, to what Places, and which is, by Cuſtom, to have the Preference of being bliſtered firſt. So that he who will bliſter, or do any thing elſe out of the Faſhion, is hardy indeed, and runs no ſmall Risk.

I am perſwaded that Miſtakes are frequently committed, both as to the Times of Application and the Places to which *Bli-*

sters are applied. This *Fever* I have observed to be attended with a *muscular Tension* or *universal Spasm*; and this owing to a *Lentor* in the Blood, having more or less Tendency to Inflammation. Blisters are absolutely necessary to attenuate this *Lentor*, and the good Success of them every Day convinces us of their Efficacy this Way: But then they very much increase the *Spasm* that attends the Fever, especially if applied to Parts more irritable, as Back and Arms. I have been much disappointed, and at my Wit's end what to do, when Blistering, which I most trusted to, has heightned all the Symptoms; and this was most observable from the Pulse, which, in the Intervals betwixt the different Blisterings, was pretty full and soft, upon every new Application becoming smaller and more contracted, other bad Symptoms increasing in Proportion. This Contractedness of the Pulse I could attribute to nothing but a *general Spasm*, from a *Stimulus* applied to a nervous Part, as is the Skin, which by Consent will bring every Part of the Body, capable of it, into a State of Contraction; and this is a Property every particular Fibre is endowed with.

To increase the contractile Power of the Vessels, is, in some Cases, a very good Intention,

tention, whereby to attenuate the Viscidity of the Blood; and that is, where the Vessels are relaxed beyond their just Dimensions. But, in the present Case, the Vessels seem to be too much contracted, perhaps within their natural Diameters; and to increase their Force now, would be to render yet more compact their sizy Contents: Which possibly might be dissolved and rendred fit for Circulation, were the *Structure* of the Solids taken off, and Room given to the Particles of the Blood, now strongly in Contact, to secede from one another; proper Attenuants of the Blood and Diluents being given to assist herein.

Blisters are likewise hurtful, as they draw off a great Quantity of *Serum*, and leave the Blood thicker. 'Tis true, the good Effect of a Blister in attenuating the Blood, may make Amends for all the Loss of *Serum* by the blistered Part. But I mention this Inconveniency, because I think Blisters are not always intended to evacuate. And we should be very careful not to make any considerable Drain of *Serum* from the Blood; because it is so necessary for the Dilution of its thicker Parts, and so hinders Obstructions from being formed. But, which is worse, the Loss of *Serum* by *Blisters*, is the same as taking away the

ſame Quantity of Blood, which the Patient is not in a Condition to bear.

I know it is abſolutely neceſſary to do ſomething, the ſooneſt we can, in *Fevers*, that we may be before-hand with the Diſeaſe; for an Opportunity loſt at firſt may not afterwards offer. And from what I have been ſaying, you muſt not think that I am againſt the Uſe of Bliſters; but I would gladly fall upon ſuch a Way of applying them, as they ſhall anſwer all that is propoſed by them, without the Hazard and Inconveniency that attends the Application of them the ordinary Way. If I durſt propoſe a Method, it would be this:

Upon the firſt Appearance of the Head being affected, as when the Urine turns pale, when they ſigh and have great Anxiety, are deaf, or the Eyes ſparkle, or look ſtaring, *&c.* I would have a Bliſter applied to the whole Head. This I have ſeldom ſeen done, till the *Delirium* was come to a great Height, and ſeemed then to be done as a Puſh for the Patient's Life, when indeed it is more likely it did Miſchief; but might have done great Good, had it been applied ſooner.

We have Inſtances where, by bliſtering the Head, giving the ſtrongeſt Alexipharmicks, and every thing that could quicken

Nature,

Nature, the mortal Symptoms have been commanded after they were come on. But I am apt to think, that this happened in very low Caſes, where the ſtrongeſt Spur was neceſſary, and could do no Harm. And ſingular Inſtances ſhould not determine us to ſtick cloſe to a Method, as if the firſt Symptoms of a *Delirium* were too inconſiderable to require this *Herculean* Remedy, but the Symptoms are ſuffered to go on to their greateſt Height before it is applied, leſt we ſhould be thought to do too much where leſs might have done. Beſides this very bad Reaſon, if ever uſed, the Appearance it has of Severity makes People afraid. But bliſtering the Head does not put ſuch a Force upon Nature as is thought, nay not ſo much as bliſtering other Parts. A Bliſter on the Head gives far leſs Pain than when applied to any other Part; which ſhews that this Part is leſs irritable, and conſequently all the bad Effects from too great Irritation will be prevented; which, I ſaid before, were an Increaſe of the *Spaſm*, and a further *Stricture* of the Veſſels. A Bliſter betwixt the Shoulders has been known to bring on a *Delirium*, which has not gone off till the Bliſter was removed. This could be occaſioned by nothing but the Irritation.

When a *Delirium* comes on, there is then a beginning Obſtruction of the Brain. By applying a Bliſter to the Head, we endeavour to attenuate and diſlodge this Obſtruction; which we have a good Chance to do, while it is but ſmall, and the Veſſels have not loſt their Action by being over-diſtended. If we can reſolve the Obſtruction at this Time, the ſame Cauſe that reſolved it will alſo ſtimulate the Veſſels, and give them a Firmneſs able to reſiſt the Viſcidity being forced into them any more. Beſides, the Blood will be more determined to flow by the external Carotids, by which the Preſſure will be conſiderably taken off the Brain. And will not a *Stimulus* affecting the Muſcles and Membranes of the Head externally, accelerate the Blood's Motion in the external Jugulars, and ſo give ſome Relief to the Brain this Way? Thoſe acquainted with the Anatomy of this Part, will eaſily find how Bliſtering anſwers the Purpoſes both of *Revulſion* and *Derivation*; and how the active Parts of *Cantharides* may paſs into the Brain, ſo as to reach the ſmalleſt Veſſels that are obſtructed.

Wherever there is an Obſtruction, we incline to make our Applications as near the affected Part as we can. By bliſtering the Back then in a *Delirium*, we fail in this Rule,

Rule, this Part being very remote from the Seat of the Obſtruction; and all the Good that is obtained, is by attenuating the Blood in general: When in the other Way, the whole Force of the Bliſter is immediately exerted upon the Part obſtructed.

But let us ſuppoſe the Head not to be bliſtered till late in the Diſeaſe, when the Oſtruction is great, or the Veſſels of the Brain being over-diſtended, have loſt the Power to recover themſelves; the violent *Stimulus* will tear and deſtroy theſe delicate Veſſels; or the Matter will be farther impacted into the Brain, and the Obſtruction rendred irreſolvable: And if the Veſſels have loſt their *Elater*, from an Over-diſtenſion, we do nothing at all. It is for theſe Reaſons, I fancy, that we are forbid to bliſter the Head when the Eyes are inflamed, which is a Sign that there is conſiderable Inflammation of the Brain too; and if we dare not bliſter in this Caſe, the only Time we have left us to do it in, is while the Obſtruction is forming, or at moſt has occupied but a ſmall Number of Veſſels.

I ſhall not mention the good Succeſs of bliſtering the Head in ſome Caſes where it might have been doubtful, other Things having been adminiſtred. But it was remarkable in a young Man, ill, as was thought,

of a Rheumatick Fever: A *Delirium* came on very ſoon; a Bliſter was applied to the Head, and, a few Hours after, it went off. The Surgeon coming next Day, took off the Bliſter, and very ſoon the *Delirium* returned. The Bliſter was again applied, and with the ſame Succeſs as before. It was from this Inſtance, and obſerving Symptoms to increaſe upon bliſtering other Parts, that I took the Hint to bliſter the Head firſt in a *Delirium*; and having tried it ſeveral Times ſince, I flatter my ſelf that I was not diſappointed.

When a Bliſter is applied to the Head, it is to be minded that it muſt be kept on three or four Days, becauſe it will not do its Office, to any Purpoſe, in a ſhorter Time. This is another Reaſon for applying it ſoon, that it may have ſome Effect, before the *Delirium* comes to a Height, or has continued above three Days.

I do not imagine that *bliſtering the Head* will prevent, or always carry off a begun *Delirium*. It is ſeldom we are ſo lucky in any Caſe, and I do not wonder to ſee the *Delirium* come to a conſiderable Height, notwithſtanding this Precaution. But if by it we can ſo diſpoſe the Veſſels of the Brain, or the obſtructing Matter in them, as that the Obſtruction ſhall be reſolved in a proper

per Time, which happens when the *Delirium* does not continue above four Days, then I think we do a great deal.

While we are thus endeavouring, by bliſtering the Head, to reſolve a beginning Obſtruction, and render the Brain ſome way able to reſiſt being farther obſtructed, the Legs ſhould be bliſtered, that the Force of the Circulation may be determined downwards, and the Head relieved. I once imagined, that Bliſters at the Legs gave little Pain, having had ſome Inſtances where the Patient made but little Complaint of them: But I am now convinced they are the moſt painful of all Bliſters. It does not ſeem agreeable to the Scheme I am propoſing, to bliſter the Legs; becauſe of the great Pain and Irritation, and Loſs of *Serum* that happens by it, and which I alledge ſhould be prevented. I own there is a Difficulty here, and every thing has its Advantages and Diſadvantages. Though there is a conſiderable Loſs of *Serum* by bliſtering the Legs, a Diſcharge may be more ſafely promoted here than from any other Part; it ſtrongly diverts the Humours from the Head. The Senſe of Irritation will be much abated by the frequent bathing of the Legs, which may be done ſome Time before the Bliſters are applied. The Hair ſhould be ſhaved off

the

the Legs, becauſe of the exquiſite Pain the pulling of it occaſions in dreſſing the Bliſters.

The Feet and Legs ſhould be warm-bathed two or three times a-day. By this not only the Parts to which the Bath is immediately applied will be relaxed, which will a good deal allay the *Spaſm* through the whole Body; but a great many aqueous Particles will get into the Blood, which, mixing with it in the extremeſt Veſſels, will cool and attenuate, and be more effectual than drinking plentifully, to dilute it. Such Things may be put into the Bath as will beſt anſwer theſe Ends.

Your Obſervation comes in very properly, as a Caution not to be too free in bathing the Feet, however harmleſs it appears to be: I was not aware of the Danger of it, which makes me now the more pleaſed with what you ſay of it. In *nervous* Fevers a *Delirium* is ſometimes hurried on, and much Hurt done by a *Pediluvium*. The Miſchief it does ſeems to be owing to the withdrawing too much from the Head. As they cannot bear Bleeding, but faint from Lowneſs; ſo neither can they bear the ſimple Revulſion, by putting the Feet in warm Water, with the Head elevated, (as is common, to get them into the Water) without

out fainting, raving, and bad nervous Symptoms.

Acrid Cataplasms applied to the Feet at this Time, might divert from the Head; but they stimulate too much, and so increase the *Spasm*, giving as much Pain for ordinary as Blistering, and the Patient is thrown into a Rage by them. I cannot conceive of what Benefit they can be when applied the third or fourth Day of the *Delirium*, being in no Sense suitable in that State of the Disease. And instead of acrid Cataplasms, those of an Anodyne relaxing Virtue, and that some way attenuate the Blood, are more proper; such as, *Capita papaveris*, *Sal ammoniacum*, *Stercus bovinum*.

Epithems will be of good Service here, and the best I know is one you mentioned to me of *Wine*, *Camphire*, and *Acetum rosatum*. This applied to the Temples and Forehead, Armpits, Wrists, and other nervous and glandular Parts, will very much sooth and allay the *Spasm*; and being grateful to the Smell, and penetrating, will refresh, attenuate and resolve. Something answering the same Intention, may be frequently smelled at, and snuffed up into the Nose.

If by blistering in this Manner, and other Assistances, we can hinder a *Delirium*

to come on, or ſo provide againſt it when it does come on, as there ſhall not be a confirmed Obſtruction; we may then proceed to bliſter other Parts as the Diſeaſe ſhall require: Nor need we fear that the Irritation, or a large Evacuation, which ſometimes happens, will be ſo hurtful now as they would have been ſooner.

You'll certainly be thinking by this Time, that I have ſaid enough about increaſing a *Spaſm*, and Loſs of *Serum* by Bliſtering. I have obſerved that this Fever was attended with a notable *Orgaſm*, ſo great, that upon every little Diſturbance or Irritation, the Patient was thrown into Heats, Anxiety and Diſorder, which neceſſarily increaſed the *Delirium*. It is of the greateſt Advantage to Patients, that they be kept in a dark Room, free from Noiſe, or any thing that may diſturb them: And if we are thus careful, by a proper *Regimen*, to procure them Quiet; ought we not to be as much ſo in all the Applications we make to them? If we are not, it is juſt like one with ſore Eyes, who finds great Relief, by having them covered from the Light, but has a Candle held to his Skin till he is burnt; though he be free of Pain one Way, he feels the Smart another. All the Quiet one may enjoy in Darkneſs, Silence,

and

and by other good Management, is ſoon at an End, when Nature is fretted by the painful *Stimulus* of a Bliſter. This way of Reaſoning will ſeem to bar the Way to Bliſtering altogether, becauſe Pain and Irritation are inſeparable from it. But I think I have ſhewn how they may be in a good meaſure prevented; and it will not be alledged, that Bliſters are uſeful only as they ſtimulate and give Pain. I have ſaid before, that they are not always intended to evacuate; and I ſay now, that they would do more Good in many Caſes, if they did not irritate at all, or but very little. In our Fever I cannot allow that they are otherwiſe uſeful than by attenuating the fizy Blood, which they do powerfully, by means of a volatile highly alcaline Salt. So that the Conſequences of Bliſtering, a painful *Stimulus* and great Evacuation, ought as much as poſſible to be prevented. In other Caſes, where there is great Laxity and Diſſolution of the Blood, they will be uſeful, both as they are a brisk *Stimulus*, and promote a plentiful Diſcharge of acrid or ſuperfluous *Serum*.

I do not know whether it be for Fear of increaſing this Spaſm, or making too ſudden a Drain of *Serum* from the Blood, or both, that we are adviſed by ſome to apply

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but a few Bliſters at a Time, and to make as great Diſtance of Time betwixt the Applications of them as the Caſe will allow; but then they muſt be kept running a good while. This way of turning the Bliſters into Iſſues will have a very good Effect, as it makes a moderate Diſcharge from the Blood, as it determines the Circulation to ſome particular Parts, and by a gentle continued *Stimulus* keeps it up, and prevents Stagnations in the *Viſcera* and Organs. I have obſerved it to do very well when the Fever runs out beyond the fourteenth Day, and the Patient through Weakneſs, or that a ſenſible Criſis has not given a Turn to the Diſeaſe, ſtill labours under it, and the Event is doubtful. The only Hope we have ſometimes is, that Things are at a Stand, and the Symptoms do not increaſe. In this Caſe I am always loth to harraſs Nature by a new Application of Bliſters, leſt the Strength ſhould ſink. But if ſhe be well managed, ſhe will at laſt do the Buſineſs. For I judge the Diſeaſe is for moſt part at a Height, the Time I mentioned (*they ſeldom die when they get over the fourteenth Day*) and muſt decreaſe, though ſlowly: And all that ſeems neceſſary to be done is to keep the Bliſters running, to give ſuch Things as may inſenſibly waſte the Diſeaſe,

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as Diaphoreticks and gentle Purgatives, (I give ſmall Doſes of *Pil. Ruſi*, and frequently;) not forgetting to nouriſh according to the Strength, and to give proper Cordials, leſt they languiſh into a *Hectick*, and go off that way. This *Hectick* is of the intermittent Kind, partly from *Inanition*, partly from the Matter of the Fever not fully carried off. Bliſtering can be of no Service, and the Succeſs of the *Cortex* I very much doubt of.

Bliſtering is reckoned uſeful, as it determines the Circulation to the outward Parts, and ſo preventing internal Obſtruction and Inflammation. I agree to it, but not in the Caſe of a *Spaſm*; which indeed is the Reaſon that the Blood is forced from without inwards, upon theſe Parts where there is the leaſt Reſiſtance.

It ſometimes happens that the Patient is fatigued with continual or partial *Sweats*, and the Loſs of the more watery Parts of the Blood, ſo neceſſary to cool and dilute it, ought carefully to be prevented. Theſe Sweats are ſymptomatical only, and give no Relief, but frequently the Sick grow worſe upon them: And they are owing to a *Stricture* upon the Veſſels, by which the watery Parts are expreſſed and poured out by the Skin; which is relaxed, and eaſily allows

allows the expreſſed *Serum* to paſs through, for want of a due Secretion of Spirits from a thick Blood, or that this ſizy Blood cannot be circulated into its Veſſels, to give it a Tightneſs. That there is but a ſmall Force of Circulation towards the Surface, appears from the Degree of Heat felt upon the Skin, which is ſeldom more than natural. I have ſeen a Bliſter ſtopping theſe Sweats, no doubt by giving a greater Firmneſs to the Skin. But as I make a Scruple to apply a Bliſter too ſoon, unleſs to the Head, becauſe it increaſes the *Stricture*; ſome other Method may be tried to prevent the Sweats, cauſing the Patient to ſit up in Bed, if he is able, and ordering the Bedcloaths in a proper manner.

There is one Thing more I would obſerve, it is with reſpect to the Time in which Bliſters ought to be applied; which ought never to be in the Acceſs of a Fever. The Diſeaſe has generally *Exacerbations* towards Night, which is the ordinary Time of applying them. I am ſure a Bliſter of itſelf raiſes no ſmall Degree of a Fever: Now betwixt this and the Paroxyſm of a Fever already upon him, we cannot but pity the poor Patient, who muſt undergo a pretty ſevere Trial. But this would be little minded, if the Diſeaſe were not really increaſed by

by it. For if in the Acceſs of a Fever, which we would gladly prevent if we could, Nature is under a violent *Spaſm*; it would ſeem needleſs to put a greater Force upon her, by a ſuperadded *Stimulus*. The fitteſt Time then to apply Bliſters is, when there is the greateſt Abſence of the Fever. And indeed the Management of Bliſters in this Fever, and from the Cauſe I have all along ſuppoſed, is not ſo eaſy as is thought. To apply them at ſuch Times, and to ſuch Places as moſt favours Nature, to obtain all that we wiſh for from them, and do no Harm by them, when we intend by them to do the greateſt Good; to do all this, I ſay, will require ſome little Niceneſs.

In Paroxyſms of Fevers we are not at Liberty to give the *Cortex*, nor in convulſive Caſes, which are always attended with Pain and Tenſion. This Medicine, if given in the Fits of theſe Diſeaſes, while Nature is under a violent *Spaſm*, might, by its great *Stimulus* or aſtringent Quality, ſo ſtraiten the Veſſels as to occaſion a Strangulation in them; ſo that however uſeful it may be out of the Fit, we find by Experience that it is hurtful and dangerous in it. The ſame may be ſaid of all theſe Things which act by a ſtrong *Stimulus*, which we are careful not to apply in the Acceſs of Fevers, but rather

ſuch Things as ſoothe and relax, and in ſhort have an Effect quite oppoſite to that of a *Stimulus*. And thus I have told you my Opinion about Bliſtering, and the Time and Manner in which I would have it done: You ſee I have only taken the Liberty to invert the Order, doing that firſt which is generally deferred to the laſt. When I reaſon upon the Nature of an Obſtruction, together with the Time and Methods proper for Reſolution, I cannot think but this way of Bliſtering is more agreeable to the Notion we have of theſe Things than that which is commonly followed.

But bliſtering will not of it ſelf do all. I have ſuppoſed, as the Cauſe of the Fever, a *Lentor* of the Blood, and a *Spaſm* conſequent of it; and theſe depend ſo much each upon the other, that without ſome Caution we may, providing againſt the one, eaſily increaſe the other. The Intention of Cure then will be double, to attenuate the *Viſcidity*, and allay the *Spaſm*. Bliſtering is very well fitted to anſwer the firſt, but with this Inconveniency, that it encreaſes the other, unleſs managed in ſome ſuch Manner as I have hinted; and at the ſame time Medicines be given that may anſwer the other Intention, or both.

Common Practice bids us, without ma-

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king proper Diſtinction, give warm, generous Medicines, Alexipharmicks, and all of that Tribe that heats, ſtimulates and forces Sweat. But if what I have ſaid about Bliſtering be true, we will ſee that Medicines of this Kind are ill-ſuited to the Nature of this Diſeaſe, at leaſt in many Caſes. For theſe Things that ſtimulate, and ſo increaſe the Circulation, will but farther increaſe the Spaſm and Obſtruction. And if Sweats are forced, this will render the ſizy Blood ſtill thicker, and leſs fit for Circulation.

It will be ſaid however, that this Fever is attended but with a ſmall Degree of Inflammation, and little Increaſe of the Circulation; which ſeems to indicate Medicines of the warm Kind. This at firſt View will appear true; but I am convinced from Experience, that Nature is here as much affected with a *Spaſm*, as in ſome Caſes where there is greater Inflammation; and that this *Spaſm* would not produce the bad Effects it does, if Nature were not forced on, by indiſcreet Methods, to exert herſelf in the Cure of the Diſeaſe more than is neceſſary. The many Inſtances of Recovery amongſt the poorer Sort, who have little Attendance and leſs Medicine, may be a Proof of this. The Lowneſs of the Pulſe, Fainting and moderate Heat, impoſe upon

us, making us believe that the Blood is poor or defective, or that there is ſomething of Malignity, (which is not very well underſtood) and that upon theſe Accounts the vital Functions are not performed: And upon this Suppoſition, the Indication is taken for warm ſtimulating Medicines. But it may be eaſily made to appear, I think, that theſe Symptoms proceed from a very different Cauſe, *viz.* a *Lentor* of the Blood, and a *Spaſm* depending upon it; which is the Reaſon that there is a leſs Secretion of Spirits for the Uſe of the ſeveral Organs, and a more difficult Circulation through the whole Syſtem of Veſſels. From the ſame Cauſes in other Diſeaſes we obſerve the ſame Effects. This is plain in the Caſe of *Vapours* or *hyſterick Fits*, which moſt frequently are thought to proceed from a Viſcidity of the Fluids, and ſuch a Conſtitution of the Solids, as I chooſe to call a *genus irritabile*. A rational Practice has found, that in this Diſtemper, I mean in the Fits of it, warm, ſtimulating, or highly attenuating Things, given with a Deſign to raiſe the Spirits, are not the ſafeſt.

But the Connection betwixt *Vapours* and a *Fever* will not be eaſily perceived; nor is it neceſſary, in Reaſonings of this Kind, that Things ſhould anſwer ſo exactly in all

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Circumſtances. I ſhall own my Want of Invention, in not being able to contrive a different Cauſe for every different Diſeaſe that may fall in the Way; but I endeavour to purſue the ſame Cauſe through as many Diſtempers, and Degrees of a Diſtemper, as can be done with any Probability: Though in all Appearance the Difference is very great betwixt an acute and a chronical Diſeaſe; perhaps it will not be found ſo, when the Thing is more nearly conſidered. For do we not ſee acute Diſeaſes ending in chronical, when the *materia febrilis* is not fully exterminated? There ſeems to be no other Difference, but that the Cauſe not exiſting in the ſame Degree or Force, cannot produce ſuddenly a Train of violent Symptoms, as it did, when, in a greater Degree, it was the Cauſe of a Fever. On the other hand, many chronical Diſeaſes are not cured, but by a ſupervening acute one. Thus *Palſies*, *Epilepſies*, and ſeveral other Diſeaſes we have no Name for, have been carried off by a *Fever continual* or *intermittent*. Now whether is this *Fever* accidental, and in its Cauſe different from that of the former Diſeaſe; or is it the ſame Cauſe increaſed, or acquiring ſome new Quality, ſo as to be able to excite a Fever? The more obſtinate chronical Diſ-

eases are said to have been cured by a *Quartan*. I shall therefore, with Leave, call this the *Mid-way* betwixt acute and chronical, unless a *Quintan* or *Sextan* be more properly so; but these rarely happen. In chronical Diseases the Cause of them seems to be seated in the smaller Vessels, and has not such Properties as to produce any Effect in the larger Vessels, which I take to be the Scene of Fevers. But if this Matter, from its Nature, or a Course of external Causes, changes its Seat, and in the larger Vessels forms larger *Moleculæ*, acquires new Qualities, and is put into Motion, we may conceive how at length it will produce a Fever: And proportionally to the Degrees of Increase, it will at first, leaving the Form of a chronical Disease, appear in an acute Form of the longest Period, and so on till it becomes a Fever without Periods, or continual. When I have said this, it will look strange if I say again, that the Accesses or Fits of chronical Diseases, many of which are periodical, some regularly, some irregularly, are Efforts of Nature, to put on an acute Form: And when all our Art has been baffled in the Cure of them, we have been glad to leave them to the Chance of an acute Distemper, by which they may be carried off. Though I say that

this

this Change of a chronical Diſeaſe into acute, is owing to an Increaſe of the Cauſe, I do not mean it as bad; for this Increaſe is a gradual Tendency of the Matter to Coction, to be aſſimulated again to the Maſs of Fluids, or wholly expelled the Body.

Nor with reſpect to the Cure of both are the Intentions different. The moſt general are, to evacuate or ſuppreſs an Evacuation; to attenuate the Blood, or preſerve its Conſiſtency; to reſolve an Obſtruction; to correct Acrimony; to reſtrain the irregular and increaſed Motion of the Fluids, or raiſe it when too languid. All theſe Ends are obtained by the ſame Means. The only Difference then is this: In acute Caſes, the Diſeaſe finiſhes its Courſe in a ſhort Time; the Symptoms during this Time are all upon the Patient at once, and very urgent. The Matter of the Fever is either very moveable, and ſo may eaſily be thrown upon ſome Part neceſſary for Life; or it is firmly inherent in the Veſſels, and by a too forcible Trial to remove it, may form a mortal Obſtruction. This obliges us to be cautious both in the Choice and Application of Medicines, and very obſervant of the Times that are moſt proper for ſuch Application. On the other hand it is eaſy to ſee, that in chronical Diſeaſes we are more

at Liberty, and may sometimes make a bold Attempt for the Patient's Recovery; nor need we be so exact, either in the Choice of Remedies, or in the Time and Manner of applying them. It would be taking up your Time too much, to advance all that might be said upon this Head, the Design of which is to shew, that we should not put such a Difference betwixt acute and chronical Diseases, as not to admit of Reasoning from the one to the other, or think that the Methods of Cure are as opposite as some imagine the Causes of them to be. I do not think I am straining the Thing, when I plead the Practice in some nervous chronical Distempers, as an Argument for the same Practice in this Fever; which, because of the near Resemblance it has, in many Things, to these Diseases, is properly enough called *nervous* too.

The Medicines I would choose, as best suited to the Disease, are such as do not stimulate, or but very little, nor increase Inflammation: *Oculi & chelæ cancrorum, Sperma ceti, Rad. serpentariæ Virg. Valerianæ sylv. Castoreum, Sal prunellæ, Sal absinthii, Sp. nitri dulcis, Sp. salinus aromat. Sp. cornu cerv.* and the like. *Antimonium diaphoret.* is highly commended by some in a *Delirium*. *Saffron* in small Quantity

Quantity is anodyne. If we examine into theſe, the moſt of them will be found to enter into the Compoſition of the moſt celebrated antiſpaſmodick Remedies. As ſome of them allay the *Spaſm*, others attenuate the Blood; both which contribute to keep up a free Perſpiration, which is always a good Sign, forced or continual Sweats being generally hurtful. They may be mixed and proportioned as there is greater or leſs Tendency to Inflammation. They may be given with more Advantage in ſmall Doſes, and every Hour or two, than every fourth or ſixth Hour, as is commonly done; when the Doſe being larger, the Patient finds himſelf heated, ſweats and is uneaſy: Whereas by giving them in ſmall Doſes and frequently, we put no Force upon Nature, and have a conſtant, equal and gentle Effect from the Medicine. They may be given conveniently in a Julep made up of cordial and analeptick Waters, as they are called, which may be drank at Pleaſure, and will not fail to give Relief under Lowneſs and Oppreſſion. We are not, upon every Change or Appearance of a Symptom, to ſtop the giving of theſe Things, or give more forcible Medicines upon an Increaſe of Symptoms. Theſe perſiſted in, even when they ſeem to be doing but ſmall

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Service, will perhaps in the Event anſwer our Expectation; for it is not the giving of a Medicine for a Day or two that will do the Buſineſs; they are very unreaſonable who look for any conſiderable Effects from ſuch ſlight Adminiſtrations. I ſhould have mentioned *Camphire*, which has this great Advantage, that it may be given in any Caſe of this Kind, without Fear of increaſing Inflammation; and whether the Caſe have more or leſs of it, it is very proper, and may be conveniently joined with other Medicines, whether intended to warm or cool. *Camphire* is really an Antiſpaſmodick, as by immediately affecting the Solids, it procures a Relaxation of them when too much contracted. How it becomes uſeful in hyſterick and maniack Caſes, as a *Diaphoretick*, *Antaphroſyniack*, &c. may be accounted for from this. The particular Manner of its Operation will be underſtood from what ſhall be ſaid, when I ſpeak of the Uſe of Wine in Fevers.

It is well known that Dilution has a large Share in the Cure of Fevers, and Drink muſt be given plentifully, not only as a Vehicle to convey Medicines into the Blood, but as it cools, attenuates, relaxes and keeps up the liquid Secretions in a natural Order. Lenient, aperient Decoctions, ſome-

ſomewhat ſaponaceous, are beſt ſuited to the preſent Caſe. Theſe, as they are eaſily miſcible with the Blood, do not run off ſo ſoon as Drinks that are thinner, or vinous, and force Sweat, which is not to be encouraged beyond a Moiſture. Though Sack-whey is the common Drink, and very good, I ſometimes prefer common Whey. When I do not, or but ſeldom, favour a Drink that has Wine in it, you'll readily gueſs that I forbid all ardent Spirits, as they ſtimulate too much, and may in ſome Degree coagulate the Blood. Nor do I ſee that ſpirituous Juleps are proper either as Vehicles, or to be taken when faintiſh. When I allow any thing by way of Cordial, it is two or three Spoonfuls of *Malaga* or *Sack* by itſelf, more or leſs as the Caſe requires. Theſe Wines being ſtocked with a rich Oil, when applied to the Veſſels, adhere, and give a kindly Heat and gentle *Stimulus*. When they are drank to any Quantity, they do more Harm than the lighter and more ſprightly Wines; but taken in the ſmalleſt Quantity, are a much better Cordial, and are preferable to ardent Spirits, which indeed have a ſudden Effect, but of no Continuance. Thoſe who have uſed any Freedom in drinking theſe Liquors, will know the Difference.

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The Neceſſity and Uſefulneſs of Wine, together with the Manner of its Operation, will appear from what follows. It is a known Property of Heat, that it leſſens the Power of Coheſion in all Bodies, and in a proportionate Degree deſtroys it in the hardeſt. This Power of Coheſion in different Bodies, when we conſider the Manner of it, is Matter of curious Speculation. But it is wonderfully adapted to uſeful Purpoſes in the flexible Canals of animal Bodies, which can be ſtraitned or relaxed from various Accidents, and as the Occaſions of Nature may require. The Effect of Heat upon the human Body is ſufficiently felt in hot Weather; when all the Solids are relaxed, even to Weakneſs and Loſs of Spirits. In the firſt Attacks of acute Diſeaſes, attended with *Horror* and *Rigor*, or the cold Fits of an Ague, the Patient ſtrives to divert the uneaſy Senſation of cold and the Struggle and Pain he is in, by drinking ſomething warm, or ſitting over the Fire; which gives ſome Relief for the Time: And the beſt Way to prevent the Severity of theſe Coldneſſes, is to put him to Bed, and give plentifully of diluting, aperient Liquors, warm. If then a certain Portion of elementary Fire, applied outwardly, gives ſo much Relief, any thing that will

have the ſame Effect, and applied to the Inſides of the Veſſels, promiſes to anſwer the End much better, of procuring an agreeable Relaxation to the Solids, under that State of Rigidity they are in, when affected with a *Spaſm.* This Effect I ſuppoſe Wine will have, if given diſcreetly.

Three Sorts of Medicines operate in this Manner, and differ only as this warming penetrating Oil is more or leſs involved. Theſe are *Camphire*, *Wine* and *natural Balſams* with their Oils. I had almoſt placed *Opium* at the Head of them, but I was afraid of a Debate. *Camphire* is extremely volatile, having nothing of Phlegm, Gluten, or impurer Oil to hinder it from flying off. Its Volatility renders it in ſome Caſes more uſeful than Wine, particularly in Inflammations, where, did this Oil adhere to the Veſſels a long Time, it would increaſe it. But for this Reaſon, it is leſs uſeful in other Caſes than Wine, which applied to the Veſſels, adheres more firmly, and ſo has a more laſting Effect, which ſeems neceſſary in Fevers, where the Inflammation is ſmall, and the *Tenſion* great. Theſe Things, beſide relaxing the Solids by their kindly Heat, (which ſome, fond of Words, would call *congenial*) they likewiſe attenuate the Fluids, and blunt the Acrimony,

crimony, and ſo remove the Cauſes of *Tenſion* and *Inflammation*. Natural Balſams are more fit for external Application, their Thickneſs, and too great Coheſion rendering them unfit, in Caſes where the other are proper. When they are given internally, it is chiefly with a Deſign to deterge, prevent Putrefaction, and increaſe Heat, where it is below the Standard. *Oil of Turpentine* applied externally to the Spine, before the Fit of a *Quartan*, is ſaid to have been a Cure. I cannot account for this, but from the Heat it occaſions. This Heat diffuſes an agreeable Warmth through the whole Body, by which the *Tenſion* is taken off, and the Reſiſtance which was given to the Blood's Motion; which now flows eaſily into the extremeſt Veſſels.

I commonly give a ſmall Glaſs of Wine five or ſix Times a-day, and never obſerved any bad Effect from it. I have known it taken to a much greater Quantity for ſeveral Days, beſide a reaſonable Quantity of common Julep, which contributed not a little, I believe, to the Patient's Recovery. I do not think, however, that Wine is to be given at all Times of the Diſeaſe, particularly in the Beginning, when the inflammatory Symptoms are any Thing conſiderable, but for ſeveral Days before

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the Height, it may be given with great Advantage, as well as after it.

I ſometimes meet with Oppoſition in thus preſcribing Wine. The very Mention of Wine in Fevers, and where there is a *Delirium* too, is apt to give People bad Impreſſions of Raſhneſs or Want of Skill. And becauſe ſuch will not receive any Thing they are not uſed to, without the Sanction of Antiquity or great Experience, I can tell them, that this Practice of giving Wine, ſometimes in acute Caſes, has the grave Authority of *Hippocrates* to ſupport it.

Wine promiſes to be ſtill more uſeful where the Blood is poor and much diſſolved, in which Caſe it naturally acquires ſome Kind of Acrimony. For it will reſtore the relaxed Veſſels to their former *Tone*, invigorate the Blood's Texture and Motion, by ſtoring it with warm balſamick Parts, exhale the vapid *Serum*, reſiſt Putrefaction, and correct the Acrimony. Upon all which Accounts it becomes a ſovereign Remedy, in all Fevers of this Kind, that have not a greater Degree of Inflammation in them, and in ſome particular Kinds of *Small-Pox*, there does not ſeem to be a better, provided it be given in a right Manner and ſufficient Quantity.

When

When the Patient is faint and oppreſſed, wearied and anxious, we are obliged to preſcribe ſomething by Way of Cordial, when perhaps the Caſe will not allow of any Thing that is heating. I am of Opinion, that the beſt Way to procure Relief under ſuch Lowneſſes and Oppreſſions, would be by gentle Anodynes. Theſe, as they allay the *Spaſm*, would give greater Freedom to the Blood in its Motion, and have ſome Effect to attenuate it, and ſo would anſwer the Intention of a Cordial much better than what is commonly given, and which acts no other Way than as a *Stimulus*. When the Diſeaſe ſeizes with greater Signs of Acuteneſs or Inflammation, as Vomiting, Looſeneſs, Heat, Thirſt, Sighing and ſtrong Depreſſion, (as this Hurry of ſeemingly inflammatory Symptoms is more or leis, ſo will the Faintneſs and Anxiety be :) When this is the Caſe, I ſay, a gentle Opiate, given in ſome refreſhing Julep, will have a happy Effect to allay theſe over-bearing Symptoms. Theſe Symptoms then happen only the firſt Days; for by the Time the Patient is delirious, they are pretty much gone, or he is not ſenſible of them: This is the proper Time to try Opiates, leſt by the Urgency of ſuch Symptoms greater be brought on. A prudent Uſe of

them

them might hinder a Delirium from coming ſo ſoon as otherwiſe would happen. This would be no ſmall Advantage, for the Patient's Life depends upon the Delirium its coming ſooner or later. When the Seizure is with moderate Symptoms, there is little Occaſion for them, till the Diſeaſe is further advanced, and a *Delirium* comes on with Watching, Raving, and a dreadful Train of nervous ſpaſmodic Symptoms, which will not be commanded by a leſs powerful Remedy than *Opium*.

But perhaps it will be thought, that there is yet no great Neceſſity for Opiates, as no conſiderable Symptom has appeared to require them. If the Symptoms depended upon any other Cauſe than that I mentioned, I ſhould think ſo too. I ſtill inſiſt upon it, that there is in this Fever a violent *Tenſion* of the Solids, even when we cannot be ſenſible of it from more evident Appearances. And of how much Advantage it would be to ſoothe and compoſe Nature, under this *Tenſion* and Pronenels to be irritated, one may very eaſily conceive. The known Effects of Opiates, their being without Danger when rightly managed, and their great Uſefulneſs, in Caſes ſo like to this I am ſpeaking of, ſhould encourage us to try them here too. We are informed

by ſome Authors of the incredible Succeſs of Opiates in *Fevers* of a bad Kind. You have told me, that an expected *Criſis* may be ſafely promoted by giving an Opiate; this I ſuppoſe is when there is ſome Fear that Nature may fail, if not well aſſiſted in it. This has a great deal of Reaſon in it, and it cannot be uſeful this Way, but as it allays the violent Spaſm, and frees Nature from the wild Hurry and Struggle ſhe muſt be in, in the Inſtant of a *Criſis*: And by this means all Impediments being taken away, the Humours already concocted and fitted for Separation, fall off of themſelves almoſt, by ſome common Outlet, fitted according to the exact Laws of the Oeconomy, to receive them. Dr. *Boerhaave* (*a*) has an *Antipyreticon*, which in Agues he calls *raro fallens*. From my own Trial of it, I know that it will prevent the Fit for the Time, and if it does not remove the Diſeaſe, it paves the Way for more ſucceſsfully exhibiting the *Cortex*, which is given frequently without Effect. As the great Streſs muſt be laid upon the large Doſe of Opium in it, this may be referred to what is ſaid. In hyſterick Caſes, we can do little without Opiates to allay theſe ſudden and

(*a*) Libello de mater. medic. § 761.

and violent Affections of the Body in that Diſeaſe, which I have frequently obſerved to grow worſe upon the ſmalleſt Irritation. In convulſive Diſorders I think they might be more frequently uſed, and with more Succeſs than what is common. All Things adminiſtred here, externally as well as internally, are warm, ſtimulating, ſpirituous and aromatic, and therefore are ſaid to be good and comforting for the Head. I am very certain the Symptoms are frequently increaſed by theſe: But I have ſeen Bathing from the Middle down, dry Cupping, and whatever will make Revulſion, without Loſs or Irritation, and theſe Things which allay a Spaſm by their Anodyne Quality, (properly) have a ſurpriſing Effect, to procure a Remiſſion of the Fit, when the moſt noted *Cephalics* have been hurtful or uſeleſs.

In adviſing the Uſe of Opiates, I ſhall be very much under Correction; and believe that it is only in ſome Caſes of Fevers they can be given with Safety and Advantage. Where there is any conſiderable Degree of Inflammation, they are thought to be hurtful, eſpecially if there be Obſtruction of a particular Part: Yet the *Papaveracea* are given here. And where there is great Relaxation and Diſſolution of the Blood, they

are plainly out of the Queſtion. It is in a mixed Kind of Fever that they can be uſeful, ſuch as ours was, where there were Degrees of Inflammation, but that would not admit of the Methods of Cure in Inflammation, and had in it beſide a remarkable *Spaſm*. I know it will be taken for a putrid Fever of the Rheumatic Kind I have been ſpeaking of: But there was conſiderable Difference in many Things from that Fever as we have it deſcribed: And therefore I have retained the common Name of *Nervous*, being more careful to explain the Diſeaſe as it is in itſelf, than fix it to a particular Claſs: *Putrid* is a Term, which, till defined, gives me no Idea of the Nature of it.

I do not think *Opiates* are to be given to any conſiderable Degree, but in ſuch a Manner, that though their Effect can hardly be obſerved, we may be ſure they have ſome. And by mixing them with other Things, we may prevent their bad Conſequences, ſo often obſerved and juſtly feared. The bad Effects of Opiates are not from their being abſolutely hurtful in themſelves. There is a great deal in the Time, the Manner, the Doſe in which they are given; not to ſpeak of the Patient or the Diſeaſe. Were theſe Circumſtances duly

minded,

minded, Opiates might be applied ſucceſsfully to many more Purpoſes than they have yet been. I have known an *Aſthma* increaſed by what was only thought a reaſonable Doſe of *Opium*: But the ſame Quantity, or a little more, given at Times, in ſuch Manner as the whole ſhould not be conſumed in leſs than twelve Hours, has had the deſired Effect, and the Patient has been greatly relieved. Frequently we are obliged to give an Opiate in the Morning, the Effect of which is not wanted till Night, for ſome are wakeful after taking it.

I am favoured in the Opinion of Opiates being uſeful in this Fever, from the Contrivance of a Medicine now pretty much in Uſe, the Tincture and Decoction of *Serpentaria* of the *Edinburgh* Diſpenſatory, which are gently ſudorific and anodyne. The Tincture is certainly a fine Medicine, and the only Objection is, that it will be too warm in ſome Caſes, and that the *Opium* is there joined to the other Ingredients, and muſt be always given, whether neceſſary or not. I ſtill like to have it in my own Hand.

And now, to put an End to a long Letter, you will eaſily find from whom ſeveral Hints and Obſervations here are taken: Any Thing of my own will be as eaſily

diſcovered, as having leſs to ſupport it, perhaps. I have taken the Pains, however, to bring theſe Things into one View, and endeavoured to accommodate them to a general Scheme; in which I have kept as cloſe by Nature as I was able, having had all along a ſtrict Regard to the Genius of this Diſtemper. There is a great deal more to do upon the Subject: I have only attempted to ſet one Kind of the Fever in a clearer Light. I wiſh much to ſee ſome, whoſe greater Judgment and Practice might better enable them, undertaking ſomething more full and diſtinct upon it, than we have yet been favoured with.

XXIV. *Remarks on the Cure of* Agues; *by Dr.* ALEXANDER THOMSON *Phyſician at* Montroſe.

AGues having been endemick in this Place and Neighbourhood theſe many Years, I have had good Occaſion of Experience in this Diſeaſe, and ſhall mention ſome Remarks I have made in the Cure of it.

I went on ſome Years in the ordinary Way

Way of vomiting on the Days of Intermiſſion, as preparative for curing by the *Cortex*, till reading the old Phyſicians Books, I found they recommended Vomiting in the Beginning of the Paroxyſm, thinking the morbid Matter was then diſengaged and in Fluxion, particularly about the *Præcordia*, which they called its Concoction, and therefore was then fit to be pumped up from the Stomach, agreeably to that Aphoriſm of *Hippocrates*, Sect. 1. Aphor. 22. Πέπονα φαρμακεύειν καὶ κινεῖν μὴ ὠμά, &c. *Cocta non cruda eſſe movenda & medicanda.* Which Way of Reaſoning is alſo agreeable to the Account given of the periodical Returns of the Paroxyſms of intermitting Fevers by *Bellini*, and all who, ſince him, have wrote on this Subject in the mechanical Way.

Another Advantage ſeemed likewiſe to ariſe naturally from the Operation of Emeticks in the beginning Paroxyſm, to wit, that by the vigorous Shock given to all the Parts in vomiting the morbid Matter might be ſooner diſengaged, and the Fit made ſhorter, if not prevented.

This Method appeared to me ſo reaſonable and natural, that I began to give Emeticks upon the firſt Appearance of the Aguiſh Fit, and have found ſo good Succeſs

by this Way, that I have now continued in it these twenty Years past. The only Alteration I have made is, that if the Coldness of the Fit go soon of itself into a vigorous Shaking, without the Sickness of the Stomach, I postpone Vomiting till the Sickness begins in the *hot Fit*.

It is easy to see that in this Sickness, from the Flow of the morbid Matter towards the Stomach, one Half or two Thirds of an Emetick Medicine will do more and more effectually than the full Dose could do by straining Nature when otherwise at Ease. And indeed it would appear evident, that no straining by a vomiting Medicine can be well able to reach the Disease, while the morbid Matter is so blended with the other Liquors of our Body in the Intermissions.

I have frequently seen one Vomit thus given put away the Disease, or if another Paroxysm came on, it was so broken by a second Dose, that the Progress of it could scarce be observed. And I have always remarked, that when Patients were treated in this Manner, a third, fourth, or less Quantity of the Bark which was necessary to others, was sufficient to confirm and accomplish their Cure, or to prevent any Relapse.

The

The Succeſs I had by giving Vomits in this Manner in Agues, encouraged me to try them alſo in the analogous Circumſtances of other Fevers, and I have found, that by catching the Times when the *Horror* or Shivering and Sickneſs came on, to give a Vomit, the Relief and conſequent Benefit were incomparably greater than when taken at any other Time.

It is with Pleaſure I have obſerved our Phyſicians of greateſt Practice very cautious in giving the Bark for Agues; they ſeem to follow the Directions of the wiſer Ancients, in allowing the morbid Matter to be concocted, and then to throw it out of the Body before they pretend to amuſe their Patients with the Hopes of a Cure, by ſuppreſſing for a little the unealy but ordinary Symptoms of their Diſeaſe. Notwithſtanding ſuch good Example, and the many unhapy *Metaſtaſes* attended with ſuch direful Conſequences, which the too haſty and prepoſterous giving the *Bark* in great Quantities brings on, yet ſtill there are many, who no ſooner can determine their Patient's Diſeaſe to be an Ague, than they cram down as much *Bark* in the firſt Intermiſſion as they think may make ſure to prevent another Paroxyſm; and if that does

does not ſucceed, they repeat the *Bark* as ſoon as the *Fit* is over.

To deter all from ſuch dangerous Practice, I could bring many Inſtances of *Jaundice*, *Dropſy*, *Aſthma*, and all the Train of *nervous Diſorders* brought on in a ſurpriſingly ſhort Time, after ſuch preposterous Uſe of the *Bark*, which otherwiſe, when given judiciouſly after proper Evacuations, is a noble and ſafe Medicine in this Diſeaſe. At preſent I ſhall confine myſelf to two or three, where the Symptoms were very uncommon.

1. A young Man had taken five *Drachms* of the *Cortex* in each Interval of three Fits of a *Quotidian Ague*. Inſtead of the fourth Paroxyſm, he had only a little *Horror* or Shivering. Next Day, after ſome Minutes ſhivering, his Ancles were vehemently racked, as if twiſted and cut at once. This Agony laſted about five Minutes, when the Ancles being ſuddenly relieved, his Knees were as long affected in the ſame Way. Next the Joints of the Thighs were ſeized; to theſe ſucceeded a Hardneſs, Swelling, and Pains of the Belly. His *Thorax* being next ſeized, he appeared as one ſtrangled, then he fell down as Apoplectick, and laſtly turned altogether delirious. When that ceaſed after five or ſix

Minutes,

Minutes, he seemed well, about as long as from his Beginning to be attacked to his Recovery, and then underwent the same Symptoms, in the same Order and Time. He was cured by strong large Blisters, Emeticks and nervous Medicines.

2. A young Gentlewoman labouring under a *Quotidian Ague*, with some hysterical Symptoms, had a Trial made of the *Bark* in small Quantity and slowly given; but upon observing the nervous Symptoms rather increase, I discharged the further Use of it. Notwithstanding this, it was given till the *Ague* ceased, when regularly at the Time of the Paroxysm, after a little Shivering, she became speechless, her breathing alternately interrupted about half a Minute, she inspired with a *Sibilus* through her Nose, had Contractions of the *Hypochondria*, and her Belly was drawn in, with Heavings and Fallings of the Shoulders, Contractions of her Neck, Stretching of the Arms and Grippings of the Fingers: She remained thus twenty five Minutes; recovered then as long as to take a little Sack-Whey, and relapsed into the former Circumstances. She remained thus four Months: After which she began to have longer Intermissions, and some more Vari-

ety

ety in the Symptoms, but has now continued ill these nine Months.

3. A Gentleman long subject to the Ague, resolved to keep it off by a constant Diet of Bark, he got quite free of his Ague, but fell into violent lowness of Spirits, and all the Train of nervous Symptoms.

XXV. *Anomalous Shakings after an* Ague *cured; in a Letter to Mr.* MONRO *Professor of Anatomy at* Edinburgh, *from Dr.* ANDREW WILLISON *Physician at* Dundee.

SIR,

YOur Design in concluding the History of anomalous *Shakings* after an ill-managed *Ague*, (See Art. XIX. of Vol. 2.) with a general Observation of the Methods of Cure in all you had seen or heard of, being unsuccessful, was, I am persuaded, to engage any who had the good Fortune to cure such Patients, to communicate their Method to the Publick for the Benefit of Mankind; and therefore, I hope the following History of a Woman whose Case

was

was very like to the one related by you, will not be unacceptable.

In *July* 1733, an unmarried Woman about thirty Years of Age, of a plethorick Habit, who had laboured under a regular tertian Ague three Months, for which ſhe had got ſome Herbs from a Gardner, which had ſtopped the Fits, came to ask my Advice. She was then frequently ſeized with an univerſal Shaking and Trembling over all her Body, which continued long. Sometimes theſe Shakings ſeized her Head ſo violently that two Men could not hold it, at other Times one or both Arms were thus alſo affected. Her Pulſe was ſoft and languid, but her Veins appeared turgid. She had no Drought. Her Appetite was loſt. No *Menſes* had appeared for three Months. She knew when the Shakings were a-coming, and what Part or Parts would be affected; for, ſhe ſaid, ſhe felt a cold Wind coming into them. In the Intervals from *Shaking*, ſhe was drowſy and inclined ſo much to Sleep, that ſhe would have fallen from the Seat ſhe ſat on, unleſs ſhe was ſupported.

I ordered her to be let Blood of at the Ancles, and to take two *Muſtard Vomits*. Being little relieved by theſe, I deſired her to try the cold Bath, and to rub her Extremities

mities ſtrongly when ſhe came out of it.

After uſing this Method daily two Weeks, ſhe came to return me Thanks, telling me ſhe was perfectly recovered from all her Symptoms.

XXVI. *A* Mania, *from a callous* Pia Mater; *by Dr.* EDWARD BARRY *Phyſician at* Cork, *and* F. R. S.

A Gentleman twenty five Years of Age, naturally of a dark melancholy Aſpect and Temper, complained, about four Years ago, of a Weight increaſing over his Head, which ſometimes was attended with a Swimming and Giddineſs, which threw him into fainting Fits, in which he often remained for a conſiderable Time deprived of his Senſes. He ſaid that he often eſcaped theſe Fits, by keeping his Eyes ſhut when that Preſſure and Swimming ſeized him. About ſix Months before the Time I now write, his Friends obſerved his Temper much changed, and ſoon after he became diſtracted, attempting to deſtroy himſelf and others. This *Maniac* Diſorder returned frequently upon him. In the Intervals he converſed and behaved regularly. For

ſome

ſome Time paſt, he had frequently Paroxyſms of a Fever which laſted three or four Days.

His Friends hearing ſome Inſtances of Succeſs from the Operation of the Trepan in ſuch Caſes, reſolved, after many other Methods of Cure had been attempted, to have this Operation performed.

The Day after the Operation I viſited him, and ſaw him walk about his Room. Next Day he could not be prevailed on to riſe, his Pulſe became feveriſh, a ſlow *Delirium* and *Stupor* came upon him, with *Spaſms* in his Limbs, which increaſing notwithſtanding Bleeding and other Medicines, he died on the tenth Day after he was trepan'd.

Upon removing the Skull, nothing preternatural was obſerved in the *Dura Mater*; but when this Membrane was taken off, ſeveral Phyſicians and Surgeons who were preſent, concluded from the Appearance of the *Pia Mater* on both Sides of the Brain, that a large Suppuration was extended under it; for it was of a Colour between green and yellow. Upon examining it, I found it hard and callous, and in moſt Places twice the Thickneſs of the *Dura Matter*. There was no Appearance of Veſſels in it, and it cut like ſoft Horn.

The

The cortical Part of the Brain, which this thickned *Pia Mater* covered, was much whiter than usual with few Blood-vessels. On separating the Hemispheres of the Brain, the *Pia Mater*, contiguous to the *Falx*, appeared in the same morbid Condition. The *Ventricles* of the Brain were very large, and distended with Water.

XXVII. *An* Epilepsy, *from an uncommon Cause; by Dr.* Thomas Short *Physician at* Sheffield, *and* F. R. S.

IN *July* 1720, a Woman about thirty eight Years of Age was brought to me; she had laboured twelve Years under an *Epilepsy*, which, from one Fit a Month, was come to four or five violent ones every Day, each continuing an Hour, or an Hour and a half; by which she was rendred moppish and silly, and incapable to take Care of her House and Family. Her Husband was reduced in his Circumstances, from his Affection and Care for her, having got and followed all the Advice he could. Evacuations of all Kinds had been tried; the epileptick and cephalick Tribe of Medicines had been ransacked, and many other Medicines

cines had been uſed in vain, the Diſeaſe growing more ſevere. Her Fit always began in her Leg, toward the lower End of the *Gaſtrocnemii* Muſcles, and in a Moment reach'd her Head, threw her down, foaming at the Mouth, with terrible Diſtortions of the Mouth, Neck and Joints. Whilſt I talked with her ſhe fell down in a Fit: I examined the Leg, and found no Swelling, Hardneſs, Laxneſs or Redneſs different in that Place from what was in the other Leg: But ſuſpecting from her Fit beginning always at that Part, that the Cauſe of her Diſeaſe lay there, I immediately plunged a *Scalpel* about two Inches into it, where I found a ſmall indurated Body, which I ſeparated from the Muſcles, and then took it up with a *Forceps*; it proved a hard cartilaginous Subſtance or *Ganglion*, about the Size of a very large Pea, ſeated on a Nerve, which I cut aſunder, and took out the Tumor. She inſtantly came out of the Fit, cried out ſhe was well, and never after had a Fit, but recovered her former Vigour both of Body and Mind.

XXVIII. *Of the Cure of an* Ulcer *of the* Lungs *by Blood-letting*; *by*——

Gentlemen,

IN my present Circumstances it would be inconvenient for me to appear openly as an Advocate for the Cause which I here plead: This obliges me to beg you would suppress my Name, if you think fit to publish this Essay; which, though it should be generally condemned, may at least have the good Effect of engaging others to contrive a more successful Method of Cure than has hitherto been made Use of in this frequent and most dangerous Disease the *Consumption*. I flatter my self you will more readily allow me to remain concealed, that I have advanced no Facts which require a particular Voucher; and that you will thereby much oblige, *Yours*, &c.

THE *Ulcer of the Lungs* is a Disease so frequently fatal, that some of the ablest Physicians make it a Question whether ever a Consumption from that Cause has been cured. And indeed whoever considers the important Office of this *Viscus*, its spungy Texture,

Texture, its perpetual Motion, and the particular Rapidity with which the copious Blood pours through its Veſſels, will not be greatly ſurprized that a Suppuration here ſhould ſo little yield to the Efforts of Phyſick.

A good many different Methods of Cure have been tried, but none of them is much celebrated for its Succeſs: A new one has been lately recommended, which, in my humble Opinion, is by no means abſurd, I mean that of frequent Bleeding in ſmall Quantities.

Young People of plethorick Habits, and ſuch as have been accuſtomed to frequent Blood-lettings, are very often ſubject to this Diſeaſe; and in theſe it is generally obſerved to be moſt acute, and to ſlide on the faſteſt to its Cataſtrophe. In ſuch Patients I ſhould take Dr. *Dover*'s Method of Cure to be extreamly reaſonable, eſpecially if it is uſed with proper Cautions, and before the Conſtitution is much drained of its natural Fluids.

I ſhall offer the Reaſons that occur to me in Behalf of this Doctrine. Any body, I believe, will allow, that to heal the Ulcer is to cure the Diſeaſe; and this Method, I think, bids as fair to do that as any. 'Tis granted on all Sides, that ſome Degree at

least of a Fever, is necessary to the making of *Pus*, and that the Quantity of *Pus* will always be, *cæteris paribus*, in Proportion to the Force of the Heart. 'Tis likewise undeniable, that the more the Circulation is hurried, the Constitution is the more heated, the purulent Matter acquires the greater Virulency, becomes the sooner thin, and is the faster resorbed; while in the mean time the circulating Fluids are attenuated, exalted, and expelled the faster. Thus the whole Train of hectick Symptoms is very remarkably influenced, or rather, their Degree of Virulence is intirely determined by the Velocity of the Blood. The resorbed *Pus* occasions the hectick Fever, and that again prepares new *Pus*; that is to say, supplies fresh Fewel to the Disease. And thus the Struggle is maintained till the Heart ceases to beat.

Now as Blood-letting is the most effectual way to abate the Force of the Heart, it must of course diminish the Quantity of *Pus*, and alleviate all the bad Symptoms that owe their Origin to this *Fomes*. The mere subtracting of acrimonious Blood too seems to be no despicable Advantage, since this Diminution may easily be repaired by the Addition of more laudable Juices from the Aliments, which in this Case ought always

ways to be of a mild kindly Nature, eaſily elaborate, and for the moſt part aceſcent, to be adminiſtred frequently and in ſmall Quantities at a time. And beſides, if Bleeding takes off, or conſiderably abates the hectick Fever, it may come to be no real Expence at all, ſince by this Means the great Waſte of Fluids, by colliquative Sweats, or Diarrhœa, will be ſaved. For which Reaſons it might perhaps be, with proper Cautions, ventured upon, even in Patients that are already pretty much exhauſted: Seeing it is certain that their Veſſels are ſtill exquiſitely full, and may in Proportion to their contracted State, even ſuffer a *Plethora*; which appears frequently in the weaker Sex, who are frequently viſited with regular Returns of their *Menſes* to the very laſt Stage of the Diſeaſe, notwithſtanding all the Loſs they undergo by plentiful colliquative Diſcharges.

But the good Succeſs of Riding, and other Exerciſes, in the Cure of Conſumptions, may be objected to this Reaſoning; ſince theſe Concuſſions and Agitations of the Body ſhould, according to this Scheme, by accelerating the Motion of the Blood, rather aggravate the Malady, and ſpur it on to its laſt fatal Stage, than contribute to its Cure. This Fact at firſt Sight ſeems to

ſhake the Doctrine here advanced; but when more narrowly conſidered, I am apt to think it rather ſtrengthens it: For beſides the Advantages of corroborating the flaccid Fibres, and compacting the melted Fluids into a juſt Denſity, there is perhaps a very conſiderable one procured from theſe Exerciſes, by their enabling the Veſſels to throw out the purulent *Miaſmata* as faſt as they are taken in; and as by this Means an Accumulation of reſorbed *Pus* is prevented, the hectick Paroxyſm, during which the Ulcer is moſt ſupplied with new *Pus*, is either quite cut off, or much mitigated.

In a Word, the particular Violence with which this Diſeaſe is obſerved to act, and the uncommon Diſpatch with which it proceeds in plethorick Habits and warm Conſtitutions, plainly ſeems to indicate this Practice, at leaſt, in ſuch Patients.

Blood-letting will, for the ſame Reaſons, be equally juſtifiable in all internal Ulcers, though there ſeems to be the greateſt Neceſſity for it, when the Lungs are the Seat of the Diſeaſe, upon account of the abundant Torrent of Blood that rolls with ſo much Fury through their numberleſs Veſſels.

Before I put an End to this Paper, I muſt take the Liberty to propoſe a few Queries, concerning the Management of Conſumptions,

ons by this Method, which I ſhall ſubmit to the Conſideration of proper Judges.

1. Whether is it not a reaſonable Piece of Caution to abſtain from Blooding, as long as there are any well-grounded Suſpicions of Abſceſſes yet unbroken in the Lungs, ſince Bleeding in that Caſe would only weaken the Patient to no Purpoſe? And whether all the proper Methods of deterging and expectorating ought not to be diligently uſed before Bleeding is called in?

2. Whether it is not the moſt proper Time to let Blood when the Patient is pretty much recovered from the Fatigue of his laſt Paroxyſm, after his having cleared his Lungs as much as poſſible by coughing?

3. Whether in the very Time that the Blood ſprings, it may not be adviſeable to make him draw in gently aſtringent, drying and balſamick Steams, ſuch as of *Myrrh*, *Maſtick*, &c.?

4. Whether the more volatile, detergent and antiſeptick Medicines, ſuch as *Aloes*, *Myrrh*, Vinegar, kindled Pitch, Sulphur, &c. might not be happily conveyed to the Lungs in this Shape?

5. Whether there may not frequently be Harm in inſiſting much upon Expectoration? ſince by this Means the Ulcer is ſtill kept crude; the *Plexus* of new tender Veſ-

sels is broken in forming; the Lungs are robbed of that lymphatick and mucous Moisture, which would much contribute to heal the Ulcer *; and their Nerves are laid bare to every stimulating Cause, whence an incessant Cough, and all its bad Effects. May not antiseptick Steams, and a mild acescent Diet, Issues, *&c.* much take off the Necessity of expectorating Medicines? Are mild Pacificks (the Preparations of our own Poppies, especially their Seeds, in Form of Emulsion) mixed in small Quantities with balsamick refrigerating and gently detergent Materials, to be allowed only at Night? And even during the Operation of the Paregoricks, will not the Lungs, (if their Tone is not much enervated, and the Opiates are not too strong) when their Vessels begin to be overburdened, be sufficient of their own accord in most Cases to expel the offending Load, without the Assistance of any more artificial *Stimulus*? Does not the Success of Opium in the Catarrh, even when the Mucus is very thick and hard to be discharged, warrant this Practice, and even invite us to it?

Lastly, Would not the Bark and other Medi-

* This is in consequence of an Observation made in an admirable Essay on the Nutrition of Fœtuses in the second Volume of *Medical Essays*, *p.* 164.

Medicines that corroborate, without ſtimulating much, Frictions, and gentle Exerciſe be neceſſarily uſed at the ſame Time with Blooding, to aſſiſt in curing the hectick Fever, and to prevent Crudities, hydropick Collections and Tumors, and other bad Symptoms that might probably be introduced by Loſs of Blood?

XXIX. *A Collection of Matter in the* Liver *evacuated by Stool; by Mr.* James Jamieson *Surgeon in* Kelſo.

ON the 2d of *May* 1729, I was called to ſee the Wife of *George Tait* Innkeeper in the Town of *Yettam*, who for ſome Years had been afflicted with Pains about the Region of the Liver, a ſhort and dry Cough, Loſs of Appetite, irregular *Tremors*, and feveriſh Paroxyſms like theſe of an Ague, and a Suppreſſion of the *Catamenia*. After ſhe had continued in this State about two Years, an unequal Tumor appeared immediately under and before the *Coſtæ nothæ*, proceding gradually both Ways; till croſſing the *Linea alba*, ſome Inches below the *Umbilicus*, it filled the whole *Epigaſtrium*, to the *Cartilago Xiphoides*,

phoides, forcing the Muſcles externally to very unequal Projections, and hard to the Touch. To her former Complaints were added Vomitings, and a continual hectick Diſpoſition, whereby ſhe became much emaciated, and her Belly always coſtive during the whole Courſe of her Illneſs.

In this Caſe I found her the firſt Viſit, and adviſed calling a Phyſician, which ſhe abſolutely refuſed, from an intire Diffidence of her Recovery, joined with mean and low Circumſtances of Life, wanting only Eaſe from ſome of the moſt painful Symptoms, deſiring all the Help I could give her thereto, which was endeavoured by the following ſimple Method, *viz.* I ordered her to take a gentle Doſe of the *Pilul. benedict.* with *Calomel.* at Bed-time, and to repeat it every Night or ſecond as ſhe found it agreed with her. To uſe Morning and Evening an emollient, and aromatick Fomentation, the ſame Materials being ſometimes uſed for Cataplaſms.

From this Time I did not ſee her till the ſixth Day thereafter; when being ſent for in Haſte, I was ſurprized to find the Swellings entirely gone, and the Patient chearful in Hopes of Recovery, and only now complained of a Fullneſs in the *Hypogaſtrium*, with a little *Dyſuria*. Upon ſtriking

king that Fullneſs with my Finger, I found the Contents fluctuate; whereupon I not only adviſed the continuing of the *Pills*, but an Infuſion of the aromatick Diureticks in White Wine, with *Millepedes* and ſome of the *Sp. nitr. dulc.* with the above Fomentation uſed only at Night, and ſo left her.

On the fifth Night thereafter, an Expreſs was ſent for me to ſee her die, from a purging of her Inteſtines (as the Meſſenger expreſs'd it, by Commiſſion from both his Maſter and the Patient) which I found was occaſioned from a Stool ſhe had had in the Night, whereby about a Pound of a *parenchymatous* kind of Subſtance, the Thickneſs of brown Paper all cohering, of the Toughneſs of well boiled Tripe, and diaphanous, was diſcharged, without any other Excrement. This I cauſed to be put into a a Gallypot with ſome Brandy, brought it home, and ſhewed it to the Phyſicians and Surgeons here, and to that curious Obſerver Mr. *Monro*, the Profeſſor of Anatomy, who happened to be at *Kelſo* in a ſhort time after.

From that Time to this, the Patient has continued well, and I am informed is in perfect Health at writing hereof.

XXX. *An uncommon* Dropſy, *from a ſteatomatous* Omentum; *by* Alex^r. Monro, *Profeſſor of Anatomy in the Univerſity of* Edinburgh, *and* F. R. S.

Chriſtian Seton was ſubject to the *Eryſipelas* in her Legs from her Youth. At thirty one Years of Age married, but never conceived. Her *Menſes* left her when ſhe was thirty nine Years old. Three Years after, *viz.* in *July* 1727, ſhe perceived her Belly turning bigger than naturally it uſed to be, which ſhe imagined was occaſioned by a Draught of ſowr Wine which ſhe had taken two Years before. In *Auguſt* following, her Legs alſo began to ſwell, when ſhe asked Advice of ſome Phyſician, who ordered her ſeveral Purgatives and other Medicines, notwithſtanding which, her Diſeaſe increaſed very faſt.

When I firſt ſaw her in the Beginning of *October*, her Belly was ſwelled ſo big as to reach down beyond the Middle of her Thighs when ſhe was ſitting: The baſtard Ribs and *Regio Epigaſtrica* were violently protruded outwards, and the Point of the *Xiphoid Cartilage* was turn'd directly forwards,

wards. Her Thighs and Legs were oedematous, and double their natural Thickneſs. The upper Part of the Trunk of her Body, her Face and ſuperior Extremities were greatly emaciated. She had no Appetite for Food, but had a Thirſt, though not violent. Her Tongue was moiſt, but ſlimy. She was coſtive, and paſſed very little Urine. The Pulſe was weak and frequent. The Breathing ſo difficult, ſhe durſt not ly down, but was obliged to ſit always in an erect Poſture. A perpetual Cough, Night and Day, kept her from Sleep, and with the Cough ſhe ſpit up a thick Mucus. She was ſo weak as not to be able to ſtand. On ſtriking the Belly, the Fluctuation of Water was plainly felt. To all theſe Symptoms was added one of the worſt Circumſtances can happen in ſuch a Diſeaſe, Want of Attendance and of the common Neceſſaries of Life.

Several of the moſt preſſing and uneaſy Symptoms in her Caſe depending on the violent Diſtenſion of her Belly, I reſolved to attempt giving her ſome Relief by tapping her, which I performed in Preſence of my Colleague Dr. *John Innes* Profeſſor of Medicine, Mr. *Charles Allan* Surgeon, and ſeveral Students of Phyſick, and let out ſix *Scots* Pints, or twenty four Pounds

of

of Water, which at first came off briskly in a Stream, but in a little only dropt from the Canula of the *Trocar*, and at last stopt intirely before the Swelling of the Belly was near gone; though I took Care, during the Operation, to keep the Abdomen tightly compressed with a Belt, and Assistant's Hands, and to clean the Pipe frequently, by introducing a Probe through it. The Patient bore the Evacuation without the least Fainting, and I left her easier with the Belt I commonly use on these Occasions, well charged with the Fumes of *Benzoin*, *Mastich* and *Succinum*, applied to her Belly, and drawn pretty tight. In the Evening she took a cardiac Mixture with some Drops of *liquid Laudanum*; she slept well all Night, and was considerably refreshed in the Morning.

The *Regimen* now ordered her was to drink none, or very little; but when she was thirsty, to put a little bit of *Tamarinds* mixed with Crystals of Tartar into her Mouth; to eat Fleshes, or with any other Food to mix Wine and Spiceries; which would appear a ridiculous Direction for one in so much Poverty: But the Honourable Mrs. *Margaret Balfour* of *Burleigh*, moved with her wonted extensive Charity, had promised to supply every Thing necessary

for

for Diet or Attendance; and as long as my poor Patient lived, the Promiſe was moſt punctually and bountifully performed; for that Honourable Lady not only gave Orders to her Servants to execute whatever Directions I gave, but carefully inſpected the due Execution of them. Every Day the Patient's Belly was well rubbed with Flannels ſtrongly charged with the aromatick Fumes. Every 4th Day ſhe had a Purgative given her of *Decoct. amar. cum dupl. Senn. Unc.* ii. *Oxymel. Scillit. Unc. ſem. Syrup. de Rhamn. Unc.* i. *Pulv. Jallap. Scrup.* i. *Miſc.* And four Times every intermediate Day ſhe took the Bulk of a Nutmeg of an Electuary compoſed of *Rad. Helen. Irid. Florent. Gum. Ammon.* and *Honey*, waſhing each Doſe down with ¼ of the following Liquor, ℞ *Decoct. amar. Unc.* iv. *Sp. Succin. Drach.* ii. *Miſc.*

By the Uſe of this Sort of Diet, and of theſe Medicines, ſhe paſſed very large Quantities of Water both by Stool and Urine; and in a few Weeks all her Symptoms went off, except the Swelling of her Belly, which was however greatly diminiſhed, and gave her no Uneaſineſs.

In the Month of *February* 1728, having ſat long in Church, expoſed to the Air, which was then very cold, and having neglected

ſlected to take her Medicines ſome Time, the Quantity of her Urine leſſened much, ſhe became coſtive, and the former bad Symptoms returned. Nor could I after this procure the Evacuation of Water which had been ſo beneficial to her, by any Medicines; ſo that ſhe in a ſhort Time relapſed into as bad Circumſtances as when I ſaw her firſt, with the Addition of a very ſharp Pain under her ſhort Ribs, eſpecially of the left Side.

On the 2d of *July* I again tapped her with a *larger Trocar* than what I had formerly made Uſe of; and drew off firſt *Mucus*, then *Pus* which ſunk immediately to the Bottom of the Veſſel where the *Mucus* had been put, and had white Membranes mixed with it. Theſe two Liquors, *Mucus* and *Pus*, ran alternately, till I had evacuated in all ſixteen Pounds, when no more would run; and in the Time of the Evacuation I had frequently been obliged to draw out the tough ſlimy Stuff, which ſtopt the Pipe, with a Probe. When I thruſt the Probe ſoftly into the Cavity of the Abdomen, it was ſoon reſiſted by a firm ſolid Subſtance, which on the leaſt Touch bled. The lower Part of the Belly ſubſided remarkably on this tapping, but the *Regio Epigaſtrica* yielded nothing.

The

The Patient being no way relieved by this Evacuation, I again tapped her on the 14th *July*, but was reſolved to prevent the Matter contained from being ſtopt by a narrow *Cannula*; and therefore performed the Operation with a *Trocar* as large as my little Finger, but could bring away only eight Pound of purulent Matter. The poor Patient daily turning worſe, died ten Days after; and I was allowed to examine the Body.

Before I give an Account of what I obſerved there, I muſt ask Pardon for pretending to refer to ſuch indifferent Figures as I ſend you with this Paper; but Neceſſity obliging me to commence Painter at that Time, and being ſenſible of the Difficulty there is to repreſent Things, eſpecially ſuch as are out of the common Order of Nature, in Words, and knowing my own Inſufficiency that Way, I was afraid not to be underſtood without them: To prevent Obſcurity therefore to your Readers, or the disfiguring of your Book with bad Figures, I beg you'll be ſo good as to correct either the Deſcription or Figures, or both.

The Body being laid on a Table, had the Appearance repreſented, *Tab.* IV. *Fig.* 1. The Belly A hanging down over the Thighs, and monſtrouſly ſwelled every where, but

with a Depression D cross the Belly about Mid-way between the Navel B and the *Sternum*, the under Part of which was advanced, and the Point of the *Xiphoid* Cartilage E was directed straight forwards. The *Hypochondria* were also considerably raised. The Thighs F and Legs were greatly oedematous, and the rest of her Body was much emaciated.

The *Tunica cellulosa* of the Abdomen was very thin, without any Water contained in it. In cutting through the Muscles and Peritoneum, on the left Side of the Navel, two Pound of yellow Water ran out; and from the Cavity G (*Fig.* 2.) where this was lodged, ten Ounces of *Pus* were taken, with white tender Membranes swimming in it. Having cut the containing Parts from the Navel to the left Loin, no more Water appeared, but eight Ounces of Pus were collected. All round the Cavity, in which the Water and Pus were lodged, I observed a white hard Substance, seeming to be composed of conjoined Vesicles, and adhering strongly to the *Peritoneum*. This I dissected away from the *Peritoneum*, till in cutting upwards I had reached half-way between the Navel and *Sternum*, when it adhered so very close, and became gradually so thin, that I was of Opinion I would soon

c

er and better discover what it was, and how far it reached, by cutting it thro' at H, and opening into the Cavity; which therefore being done, I raised the containing Parts strongly, and looking behind them saw this knotty Substance BB adhering to the *Peritoneum* three Inches farther up, and then separating from the *Peritoneum*, it was extended backwards, and supported a considerable Quantity of Water D lodged above it. I next with my Scissars cut close off from the *Peritoneum* that Substance, which being extended from one Side of the Abdomen to the other, served as a sort of transverse *Mediastinum* or *Diaphragm*, to divide that Cavity into two. After this seeing nothing more above the Navel in Danger of being destroyed, I divided the containing Parts in the common Way of dissection, and turned up the two Quarters of the Teguments, now raised on the Ribs, to have a better View of the vesicular Substance BB adhering to their internal Surface: It consisted of a fatty Membrane, beset with vesicular Bodies, full either of Mucus, or of a white hard steatomatous Substance. The *Regio Epigastrica* C, *Fig.* 1. was exceedingly enlarged, and out of the Cavity D, *Fig.* 2 and 3, form'd in it, I took with a Sponge thirty Pounds of Water,

which had preſſed out the ſurrounding Bones, and had thruſt the Diaphragm conſiderably upwards. I next diſſected the Teguments from the veſicular Body F, *Fig.* 2. as far as it reached, which was to the *Oſſa Pubis*; and then divided them in the ordinary Way.

All the Teguments being thus removed, I view'd carefully the Contents of the Abdomen, yet in Sight: At the upper Part, I ſaw the great Cavity of the *Epigaſtrium* D. Below this appeared a very large membranous Sac C, of a browniſh black Colour, diſtended with Air, and reaching from the Extremity of the Cartilages of one Side to thoſe of the other, when it ſunk down under both *Hypochondria*; the middle Part of it was much the largeſt, and no Diviſion into Cells, or longitudinal Ligaments, were to be ſeen on it; though I found evidently afterwards it was the *great Arch* of the *Colon*. The Part of the fatty membranous Body left, when I cut this in raiſing the two ſuperior Quarters of the Teguments, mounted over this Sac; and then ſinking backwards, adhered to another *Viſcus*, which I could not yet diſcover, without putting ſome Parts out of their Situation; and from the under Part of this ſame Sac depended a white veſicular fatty Subſtance,

ſtance, with large Blood-veſſels, I, ſpread on it: This at firſt was thin, but gradually as it deſcended became thicker, till it was hid by the anterior *Lamella* which had been diſſected off from the *Peritoneum*. When this laſt was raiſed, I ſoftly thruſt my Hand into a large Bag form'd between the two, as far down as the *Oſſa Pubis*, where they made one continued Subſtance. Beſides theſe I could obſerve no other *Viſcus*, except the *Cæcum* or great *Sac of the Colon* K, lodged in the Cavity of the right *Ilia:* Wherefore I diſſected that veſicular Body away from all the Parts it was contiguous, or adhered to; and, in cutting, remarked, that all the little Cells, opened in this Diſſection, poured out Water. When this Body was wholly removed, (*See Fig.* 3.) I could not at firſt diſcover any thing in the Cavity below, except a flat circular Protuberance L, lying on the *Vertebræ*, covered with a dirty-black-coloured Membrane, and this, in a great many Places, had a white tender Membrane, reſembling the Pellicle formed on boil'd Milk when it cools, lying upon it. The Cavities of the Loins were very large, and filled with Water as well as the *Pelvis*, and under the Water *Pus* was every where found. When theſe Liquors were taken out with a Sponge, the Surface

of the Cavities had much the same Appearance with that of the large middle Protuberance. The cellular Substance surrounding the *Pelvis* was two Inches thick, and distended with Water and Mucus.

Looking at last narrowly to the great protuberant Body, I perceived some faint Resemblance of the Convolutions of the small Guts appearing through the black Membrane, and discovered the *Colon* MN in the same way in the Loins. When the Membrane was dissected off, all the Intestines came in View, of the Colour and Size of which they are commonly found in hydropick emaciated Bodies; but the small Guts and Folds of the Mesentery, where they were contiguous, slightly adhered to each other by a weak Sort of Membrane, which, when tore, by gently drawing the *Viscera*, yielded Water out of its Cells.

The *great Guts* were distended with Air, and in a natural enough Condition.

The *Mesentery* was shorter than ordinary, but otherwise sound.

The *Stomach* hid in the great *Epigastric* Cavity, was very little larger in its transverse Diameter than the small Guts, but of a natural Colour, without any black Membrane over it. From its *Fundus*, the Remains of the cut *Omentum* depended, which

was

Fig. 1

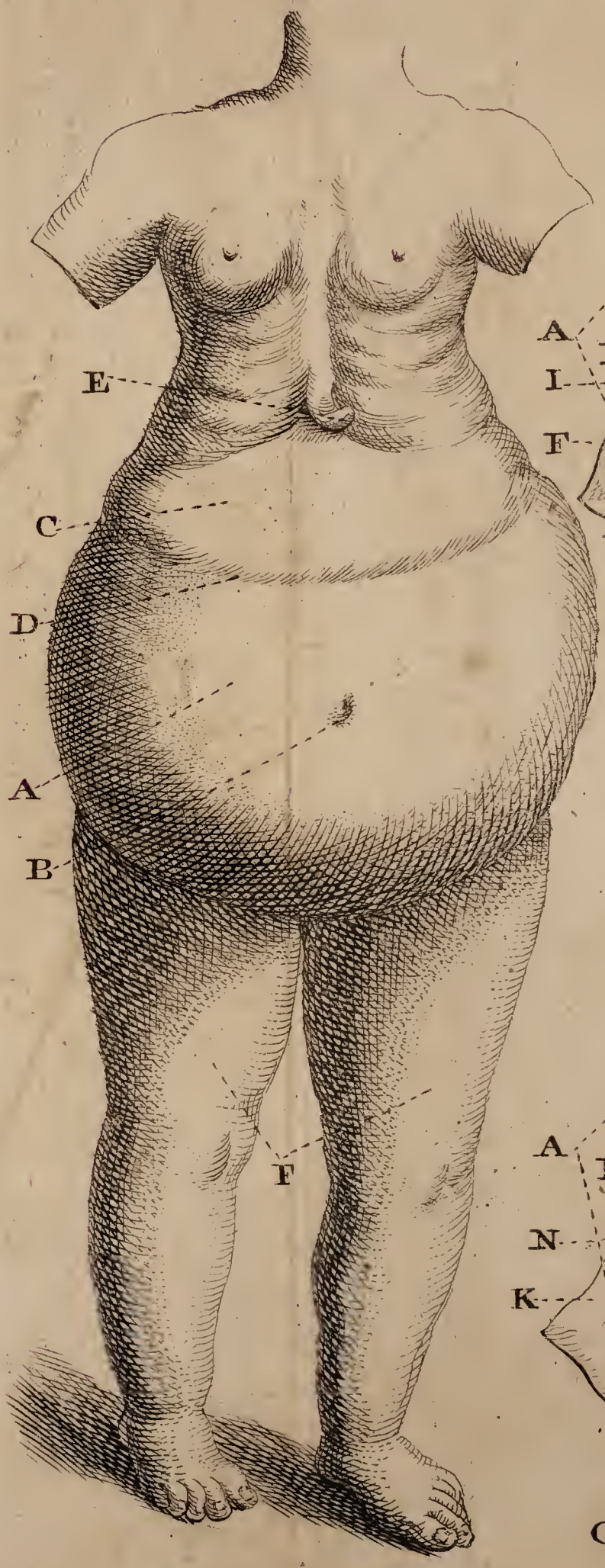


Fig. 2

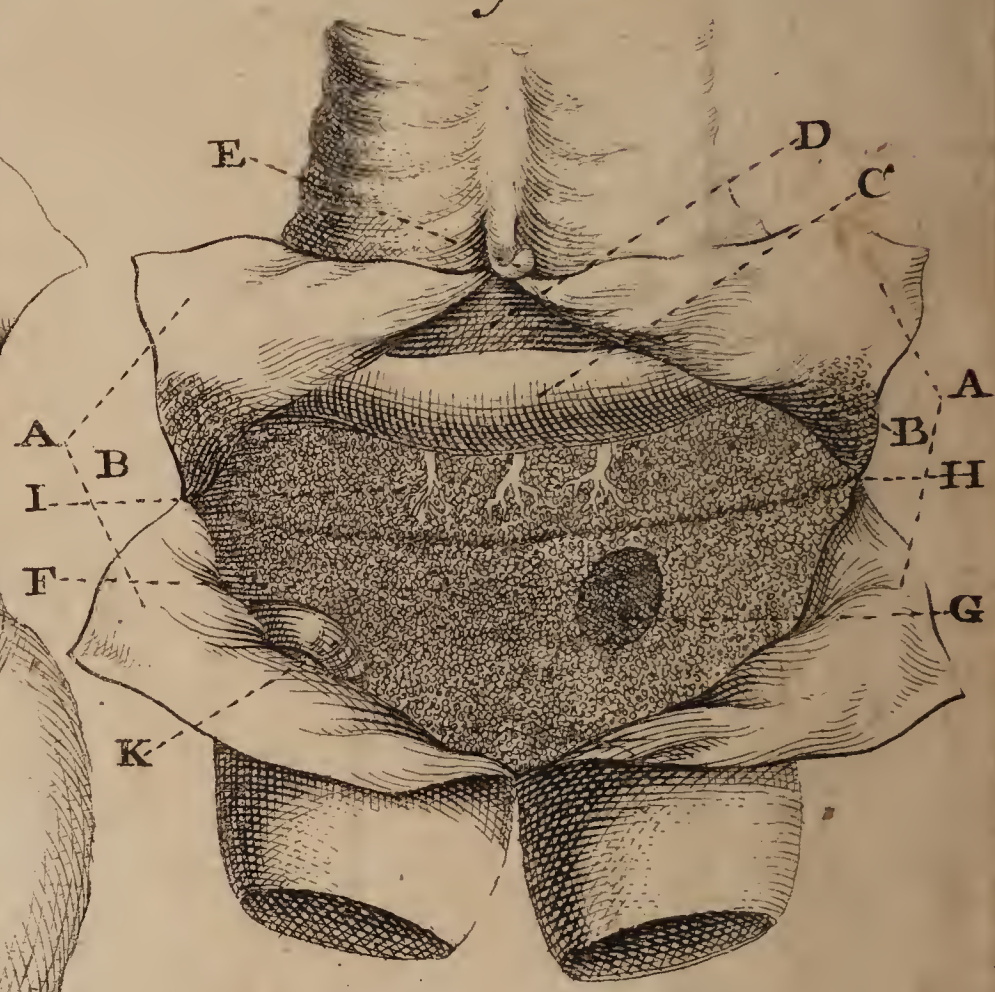
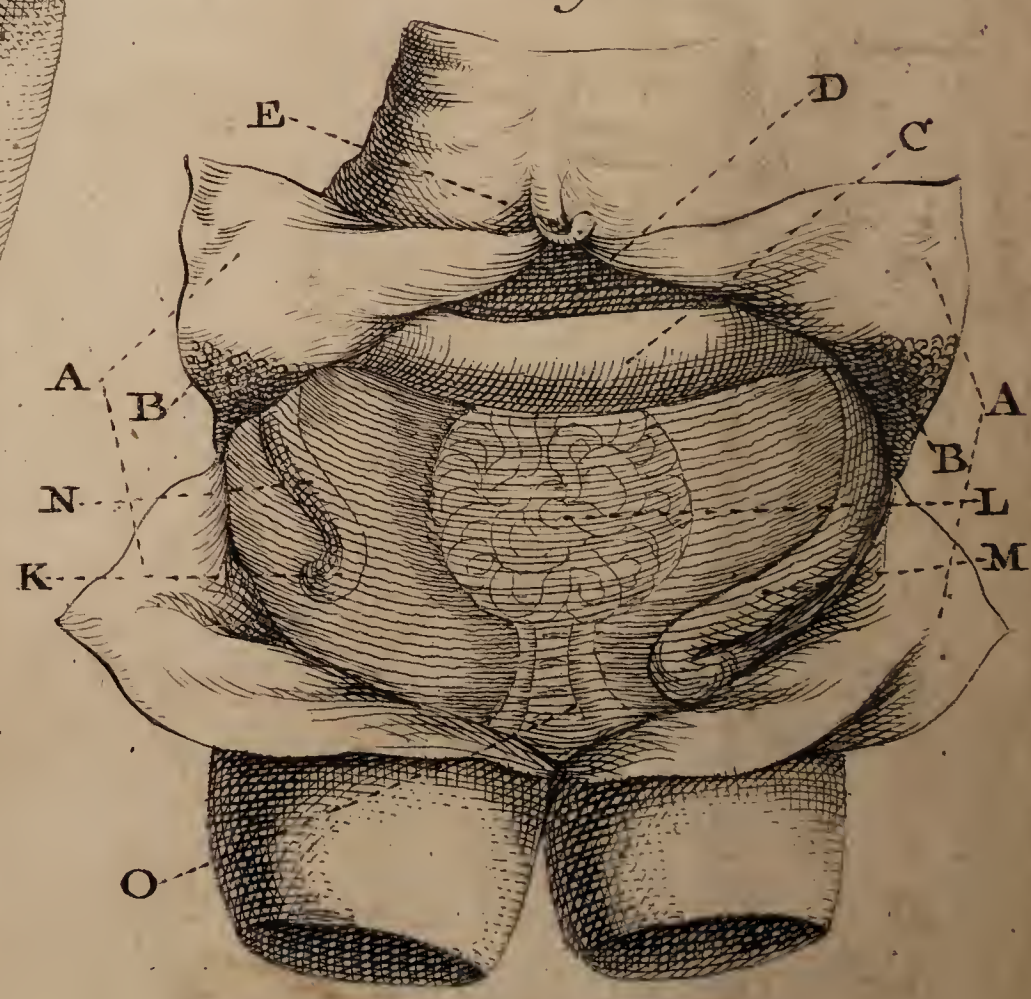


Fig. 3



was the vesicular Substance I at first divided in opening the Abdomen.

The *Liver* was quite hid under the bastard Ribs, and adhered so firmly to the livid *Peritoneum* by its Membrane, which was about a quarter of an Inch thick, that I could not observe its Colour or Substance, till I had taken off the Membrane, when this great Bowel look'd pale, and had very little Blood in its Vessels.

I found no Concretion in the *Gall-bladder*.

The *Spleen* was much in the same Condition with the Liver.

The *Pancreas* was pale and hard.

The *Kidneys* were in a natural Condition, but with little Blood in them.

The *Ureters* were of the ordinary Size.

The *Bladder*, *Ovaria*, *Tubæ Fallopianæ* and *Uterus* were all sound, only covered with a thick livid Membrane.

The Water and *Pus* taken out with Sponges amounted in all to forty Pounds.

I caused a Servant to carry home the large *vesicular Body* which occupied all the anterior Part of the Abdomen, and there examined it. It consisted of two *Lamellæ*, which were thin above, but gradually turned thicker as they descended, till, at the lowest Part where they united, they were

ſix Inches thick. Each was covered all over with a ſmooth Membrane, only the anterior was ulcerated at its ſuperior external Part. Several Ounces of purulent Matter, with Pellicles ſwimming in it, were taken out from the Cavity form'd between the *Laminæ*. When the external Membrane was ſeparated, each ſeem'd to conſiſt of Veſicles of different Sizes, ſome of which were diſtended with Water, others with Mucus, and a third Sort with a ſteatomatous Stuff. So far as could be diſcovered, there was no communicating Paſſages immediately from one Veſicle to another.

From the whole, there is Reaſon to conclude this Body to have been the *Omentum* diſeaſed, which very probably might be the Cauſe of the Dropſy, as well as Tumors of other Parts frequently are, of which I have ſeen ſeveral Examples.

Whether is it peculiar to the membranous Parts, when ſuppurated, to have Pellicles, like to that which gathers on boil'd Milk, mixed with the Pus? I have ſeen them after Inflammations of the Guts, *Pleura*, and in the foregoing Hiſtory of the *Omentum*.

Whether are thoſe Pellicles, the Membranes, ſeparated and turn'd tender by ſoaking, or the Particles of the *Pus* adhering and preſſed firm?

XXXI. *A*

XXXI. *A total Obſtruction of the* Valve *of the* Colon; *by Dr.* THOMAS SHORT *Phyſician at* Sheffield, *and* F. R. S.

April 24th 1726, I was called to *Griffin Lee*, who ſold Mild-Beer in *Coventry*, aged about Seventy, of a phlegmatick Conſtitution and groſs Habit of Body, and had a *Hernia inteſtinalis* for many Years. He had become conſtipate twelve Days before. The firſt Week he took no Medicines; the next he was attended, and had ſeveral Things from a very honeſt ingenious Surgeon; during which he was not wholly deprived of Stools, but the *Fæces* were very inconſiderable, ſmall and hard, and he had vomited what he ſwallowed, with fetid Excrements. From the *Thurſday*, when I was called, to *Monday* after, he had ſeveral Motions, but no Stools. He complained of a ſharp Pain in his Belly, eſpecially in that Part where the *Ilium* ends and *Colon* begins, and indeed all over the *Ilium*, with a Senſe of Weight and Fulneſs. His *Hernia* was not then down; his Sickneſs was little; he was able to riſe, walk about, eat and drink, if it could have found Paſſage. I

pre-

prescribed a great Variety of Laxatives in different Forms, to no Purpose. I ordered Air to be forced *per Anum* by a Bellows; it returned immediately without *Fætor*. He lived till *May* 2d, with the swelling of his Belly and other Symptoms increasing.

After his Death, the Passage at the *Valve* of the *Colon* was found shut up, and about two Fingers breadth of the Gut there was degenerated into a hard solid Substance, below which there were no *Fæces*. The small Guts were much inflammed and livid.

XXXII. *The Case of a Male Child born without an* Anus *or* Intestinum rectum; *by Mr.* James Jamieson *Surgeon in* Kelso.

Some Years ago Mrs. *Hannah*, Midwife in this Town, was called to one Mrs. *Stevenson* in *Plowland*, five Miles distant from this Place, whom she delivered of Twins, the one Female, the other Male; and discovering in the latter no Appearance of an *Anus*, came home, and sent me to see the Child, whom I found otherwise sprightly, and seemingly in perfect Health, but not the least Vestige of an *Anus* to be seen

seen or felt, but equally firm and solid from the *Coccix* to the *Scrotum*: Whereupon I told the Grandmother, who only was acquainted therewith by the Midwife, that it was preternatural, and that though I had twice seen the *Anus* covered by a Membrane, which was easily cured, I could not propose to do the like in this; but if she pleased, I should try to reach the Gut by Incision, which she, with the Mother's Consent, fondly agreed to: Whereupon I made an Incision pretty deep in the most reasonable Part, then introduced my little Finger into the Wound, to find the Gut, but in vain.

I afterwards tried the *Trocar*, which penetrated, but nothing followed but some Gutts of Blood; so was obliged to leave the Patient without Prospect of further Help from me, only desired that when he died, I might be allowed to open the Body, which I did next Day.

Upon opening the Child, I saw the *Rectum* entirely wanting, and the *Colon* was a perfect *Intestinum cœcum*, suspended loosely in the Abdomen, and full of *Meconium*; all the other Parts being in a natural State.

XXXIII. *Coagulated Blood extravasated upon the* Uterus, *and the Thickness of the* Womb, *in a laborious Birth; by Mr.* John Paisley *Surgeon in* Glasgow.

AUthors having differed very much as to the Thickness or Thinness of the *Uterus* of a Woman with Child; some with *Mauriceau* and *Dionis* (*a*) asserting that it turns always thinner as it extends, whilst others, I may say almost all Anatomists, affirm that it turns thicker as the Woman advances in her Pregnancy, and draws nearer to the Time of her Labour; or, to speak more properly, that in the several Stages, the Thickness of the Sides of the Womb keeps the same Proportion to its Cavity as in a natural State, the *Sinuses* and Vessels being proportionally enlarged as the *Uterus* is extended: I say, this having occasioned some Disputes, a mongst Anatomists, I thought proper to send you the following History of a Woman who died in Child-Labour, where I had

(*a*) Mauriceau maladies des femmes grosses, chap. 4. *de la matrice*. Dionis, chap. 1. lib. 1. *Midwifery*.

had an Opportunity of obſerving the Thickneſs of it, and at the ſame Time of diſcovering a fatal Miſtake in the Midwife who attended her, who, by delaying to call for Aſſiſtance in due Time, was the unhappy Occaſion of the Death both of Mother and Child.

Upon the 9th of *June* 1730, I was called to a Woman in Labour, about a middle Age, of a low Stature, and pretty fat, who had born ſeveral Children; and found her in an exceding low Condition, with cold Sweats, ſevere Faintings, her Extremities cold, without any Pulſe, and unable to utter one Word, though ſhe ſhewed ſome Signs of her being deſirous to ſpeak with me. The Midwife that attended her had gone off upon my being ſent for, and left a young Practitioner whom ſhe was training up in that Buſineſs, who gave me the following Account of the poor Woman's Caſe, *viz.* That ſhe had been ſeveral Days in Labour, and that all along the Midwife imagined Affairs were in a very good Way, and the Child, as ſhe thought, in a very right Poſture; though after the Waters broke, the Child's Head had never advanced by the ſtrongeſt Pains. Hence the Midwife either blamed the Mother for not bearing down ſtrong enough when the Pains came upon her, or

elſe

else pretended that the Pains were too faint and languid; and as there was no Flooding, she never apprehended any Danger, and therefore cheared up the Mother and Friends with the Hopes of a good Issue by a little Patience: And as she had a good deal of other Business upon her Hand, she frequently left the poor Woman for half a Day together, and, upon her Return, still found all Things in the same Situation as she left them. From the first Day the Woman was taken with her Pains, she scarce made one Drop of Water; wherefore on the fifth, the Midwife suspecting that to be the Cause of the Birth's being retarded, she sent to an Apothecary's Shop for a strong stimulating diuretick Mixture, to increase her Pains and provoke Urine, being assured all Things were right, only the Pains were too faint; as no Doubt they were, when the Woman had been so long fatigued with her Labour. This having no Effect, a stronger one was called for, which proved likewise unsuccessful; and all Things continued in the same State, only that the Woman's Strength was continually decaying, till the sixth Day at Mid-night, when I was sent for, and found her in the Situation above-mentioned. It is evident, when Matters were brought to this Pass, that the poor Woman had not so much

Strength

Strength left her as to bear the Fatigue of being put into a Posture for being delivered, and that it was impossible to afford her any Relief. I acquainted the Friends with it, assuring them that it would be Madness to attempt it in these Circumstances, being perswaded she could not live above a Quarter of an Hour; which accordingly happened, she dying in a few Minutes.

Next Day I prevailed with the Friends to have her opened, and after I had cut the Teguments and laid them back, I was surprized to meet with a black membranous Body like coagulated Blood, (which it in Reality was) covering all the Fore-part of the *Uterus*, though distended so much with the Child. This I easily separated in one Cake from the *Uterus*, and when it was spread upon the Table, it was about a Foot and a Quarter long, a Foot broad, and a quarter of an Inch thick. Whether this proceded from the ouzing out of Blood from the Substance of the *Uterus*, by the strong Pressure when the Pains were violent, or from the Rupture of some small Vessels, either of the *Uterus*, or some other Part of the Abdomen, I do not determine; for I could not observe the least Appearance of any ruptured Vessels in either, after the most accurate Search I could make;

nor

nor was there one Drop of Blood in any other Part of the Cavity of the Abdomen. I know not if this is a Thing that is always observed in such Cases, having had no Opportunity before that Time, or since, to examine any such Subject; tho' no Doubt it is a Thing may readily happen in very laborious Births, and then it is no Wonder that violent After-Pains, Fever, Inflammations, and their Consequences follow; for in such a bad Habit of Body, as Women in these Circumstances are generally allowed to be in, it is scarce to be supposed that coagulated Blood can be easily dissolved, and again absorbed by the Vessels in so large a Cavity as that of the Abdomen: Wherefore by its Stagnation and Putrefaction, it may bring on a Train of bad Symptoms; the Cause of which lying entirely out of the Physician's Power to know, it need be no Surprize though he fail in his Attempt to remove them; and I do not know but this may be one of the chief Causes of these many Disorders and frequent Deaths that happen after very violent and laborious Births, though there are many other Causes well enough known which are capable of producing such-like Effects.

This Phænomenon being what had never occurred to me either in Reading or Practice,

I thought it would not be unuſeful to acquaint the World therewith, to prompt thoſe of greater Abilities, or who have more Leiſure and more Opportunities of meeting with proper Subjects, to enquire, if ſuch a Caſe often happens; how far the Cauſes hinted at are juſt; or what other Cauſes may probably be aſſigned for it; what Signs it may be diſcovered by; what Method of Cure might be proper in ſuch an Event, and the like.

When I had removed this coagulated Blood, I obſerved a large Sac or Bag full of Water, lying along the Side of the *Uterus*, above the Inteſtines, and reaching as high as the Kidney of the right Side; upon feeling it all round with my Hands, I found it was looſe at its ſuperior Part, and appeared to come out from the *Pubis*, where only it had any Attachment: This upon Examination proved to be the *urinary Bladder*, thus diſtended to a vaſt Bigneſs, and thruſt to one Side by the Preſſure of the *Uterus* on the Fore-part of the Abdomen; I opened it, and meaſured the Urine, it contained no leſs than eight *Engliſh* Pints, or a *Scots* Quart.

The *Uterus* was pretty cloſely contracted upon the Child, and in opening it from the *Fundus* to the *Cervix*, I found it at

least half an Inch thick in the thinnest Part of it, though a good deal more at its *Fundus*, where I observed the *Sinuses* so large, as easily to admit the End of my little Finger into them. The *Placenta* adhered to the Fore-part of the *Fundus*. The Waters having been broke so long before, I could not expect to find the *Allantois*.

The Child had fallen down into the Passage, much in the natural Way, only with its Head a little obliquely to one Side, so that Part of the *frontal* and *parietal* Bones of the right Side rested upon the *Os Pubis* and Neck of the Bladder; and by the Violence of the Pains, these Bones had been pushed so strongly against the *Pubis* as to make a considerable Indentation in them, and raised an Inflammation for an Inch or two round the contused Part.

I believe I need scarce add, that if Assistance had been called in Time, the Swelling of the Bladder might have been prevented, by drawing off the *Urine* with a *Catheter*: And if the Child's Head could not be easily stir'd, then the Child might have been turned, and brought away by the Feet as is usual in such Cases.

Hence Midwives ought to be advised to call for Assistance in due Time, especially in a Case of this Nature, where both the

Mo-

Mother and Child's Life is in so great Danger, though there be no Flooding, since it is one of the most difficult Cases can well happen in Midwifery, and thereby they may save two Lives, and secure their own Reputation.

Hence also Physicians and Surgeons may take Warning not to trust too much to the Report of Midwives, who too often pretend all things are in a fair Way, and that there wants only some Medicine to promote the Pains that they suppose are too faint and languid, because the Head does not fall any lower by the Pains, while it may be owing to the above Cause, as well as others mentioned by practical Writers, when the giving of such Medicines may be of the worst Consequence.

XXXIV. Books *omitted in the former Volumes of this Collection.*

MIchaelis Bernhardi Valentini *Archiatri Hassiaci & Prof. Med. Gisseni Historia simplicium reformata, seu musei musеorum titulo antehac in vernaculâ edita, jam autem in gratiam exterorum sub directione, emendatione & locupletatione*

tione Autoris à D. Joh. Conrado Beckero *Medico Alsfeldensi, Latio restituta. Accedit* India literata *è lingua Belgica primum in Germanicam translata, nunc vero ad desiderium exterorum Latinitate donata, longe auctior reddita, novisque figuris illustrata à* Christophoro Bernhardo Valentini *M. B. filio, Fol.* Offenbaci ad Mænum 1733.

De Terra Tokayensi, à Chymicis quibusdam pro solari habita, Tractatus Medico-physicus; Autore D. Daniele Fischero *Hungaro, 4to,* Vratislav. 1732.

Remedios de deplorados, probados en la Piedra Lidio de la experiensia. Su Autor D. Francisco Suarez de Ribera *Medico,* Madrid 1732.

Nuove ed erudite osservazioni, storiche, mediche e naturale di Hieronymi Caspari *M. D. 8vo,* Venetiis 1731.

Alberti Haller *de musculis diaphragmatis dissertatio Anatomica, 4to* Bernæ 1733.

Cartilla Fisiologica, Galenico-espagirica, Mathematico-medica escrita par el D. Don Iuan Gimenez de Molina. Madrid 1732.

De Urinis tractatus duo, Autore H. I. Rega *in celeberrima Lovaniensium Universitate Med. P. P. 12mo,* Lovanii 1733.

Examen de Cirurgia nuevamente anna-

dido

dido con las operaciones ſu Autor el D. Don Martin Martinez. Madrid 1732.

Cæſaris Magati *de rara medicatione vulnerum, Libri duo. Acceſſit* Jo. Bapt. Magati *Tractatus quo rara vulnerum curatio contra* Sennertum *defenditur, cum Præfatione* Frid. Chriſtian. Cregut. *M. D.* 2 *Voll.* 4*to*, Amſtelod. 1733.

Clave Medico-cirurgica ſu Autor D. Franciſco Suarez de Ribera *Medico.* Madrid 1731.

Reſtauracion de la Medicina antiqua ſu Autor D. Franciſco Suarez de Ribera *Medico.* Madrid 1731.

Saggio di Medicina Teorico-practica di Carolo Gianelli *Phil. & Med. D.* 8*vo*, Venetiis 1732.

Miſcellanea Phyſico-medico-mathematica Vratiſlavienſia *Ann.* 1728, 4*to*, Erford, 1732.

XXXV. *An Account of the most remarkable* Improvements *and* Discoveries *in Physick, made or proposed since the Beginning of the Year* 1734.

FAther *Regnault* (in his *Origine ancienne de la Physique nouvelle*) has revived the Dispute concerning the Discovery of the Circulation of the Blood, alledging that *Harvey* was taught it by *Fabricius ab Aquapendenté*, to whom it was communicated by Father *Paul*, who again was, according to our Author, prevented by *Cæsalpinus*. Father *Regnault* also follows the Example of the other Writers, who endeavour to rob our Countryman of the Honour of this Discovery, in quoting Passages from *Hippocrates*, *Plato* and *Seneca*, in which, he thinks, the Circulation is described; nor does he omit the Knowledge which the *Chinese* are said to have had of it 4000 Years ago.

Dr. *Tronchin* (in his Dissertation *de Clitoride*) quotes several ancient Authors who knew the *Clitoris*, and proves *Bonaciolus* to have mentioned it before *Columbus* or *Fallopius*.

Mr.

Mr. *Morand* gives a ſhort Hiſtory of the lateral Operation for the Stone, and argues that the Methods of *Celſus*, *Frere Jacques*, *Rau* and *Cheſelden* are in the main the ſame. *Memoires de l'Acad. des ſciences* 1731.

In the End of the Year 1724 and Beginning of 1725, the *Royal Society* at *London* publiſhed Accounts they had received from *New-England* concerning *Ambergris*. In the firſt, (See *Tranſact. Numb.* 385. § 11.) Dr. *Boylſton* of *Boſton* writes the Society the Information he had from the Whale-Fiſhers. One of theſe Fiſhers having accidentally found a large Piece of *Ambergris* in a Bull-*Sperma-ceti* Whale, the other Fiſhers always afterwards ſearched carefully for *Ambergris* in the Bodies of theſe Creatures. They affirmed to the Doctor, that they never met with any except in the Male of the *Sperma-ceti* Whale, and ſcarce in one of a hundred of theſe. When they found it, it was, they ſaid, contained in a Cyſt or Bag near the genital Parts. The Bag having no Inlet or Outlet, was ſometimes found empty, tho' intire. According to the Report of theſe Men, the *Ambergris*, when firſt taken out, is moiſt, and of an exceeding ſtrong and offenſive Smell.

The other Account of the *Ambergris*, publiſhed by the Society, *Numb.* 387. § 2.

was sent by the Honourable *Paul Dudley*, on the Faith of one Mr. *Atkins*. It is more particular than the former, but agrees with it in this principal Part, *viz.* that *Ambergris* is sometimes found in a Bag situated at the Root of the *Penis* of Whales, and therefore is an animal Substance.

The Papers now mentioned have given Rise to a long Treatise on *Ambergris*, by Dr. *Neuman* Professor of *Chemie* at *Berlin*, published in the *Philos. Trans. Numb.* 433. § 5. *Numb.* 434. § 1. *Numb.* 435. § 1. in which the learned Professor relates all the Opinions concerning *Ambergris*, with the Reasons *for* and *against* those of them that are not altogether absurd, and examines in a critical Way these Accounts sent from *New-England*; from which he endeavours to prove, that what the Fishers took for *Ambergris*, was no other than *Calculi* contained in the Urinary Bladders of Whales, at least that it was not *Ambergris*: The chemical Analysis of which, shews it not to be an animal Substance; for it affords no urinous volatile Spirit or Salt, but on the contrary, a small Quantity of an acid Salt, exactly like to Salt of *Amber*, is got from it. Near the Conclusion of this Treatise, he communicates his Method of making a right Tincture of *Ambergris* in Spirit of Wine,

Wine, which, he ſays, other Chemiſts could not do. The Proceſs is very ſimple, it is only to put a twelfth Part of *Ambergris* broke into ſmall Pieces, among well dephlegmated Spirit of Wine, and then to expoſe them to ſuch a Heat in a Glaſs as makes the Spirit begin to boil.

The Quantity of *Ambergris* uſed by Dr. *Neuman* in the chemical Analyſis abovementioned, having been very ſmall, ſome *London*-Chemiſts analyſed larger Quantities, and their Experiments are publiſhed in *Tranſact. Numb.* 435 § 2. The Principles it yielded were very like to thoſe got from *Succinum*, only Mr. *Brown* could obtain no acid Salt. Mr. *Godefrey* obtained twice a ſubacid Phlegm like weak Vinegar, and in his third Trial the Phlegm rather appeared to be impregnated with a neutral Salt.

Mr. *Petit* the Phyſician concludes, from a great many Experiments he made in covering Pieces of Fleſh with the different Sorts of *Aſtringents* employed in Hæmorrhagies, that ſome act only as Abſorbents, ſuch are earthy Subſtances, moſt of the aſtringent Plants, ſome Gums, Reſines, and animal Subſtances. Other *Aſtringents* abſorb, and at the ſame time their ſaline and ſulphureous Particles inſinuating themſelves into the Fleſh, preſerve it from Corruption.

Vitriol

Vitriol and *Allum*, which are acknowledged to be among the ſtrongeſt Aſtringents, appeared by Mr. *Petit*'s Experiments to abſorb moſt Humidity. *Memoires de l'Acad. des ſciences* 1732.

Mr. *de Maupertuis* having cauſed *Scorpions* to bite ſeveral Animals, of which very few died, or ſuffered any more than the Pain of the Sting, is of Opinion that *Oil of Scorpions*, and other vulgar Antidotes to the Poiſon of theſe Animals, have rather got their Reputation from the Innocence of the Sting of theſe Creatures, than from any conſiderable Vertue in the Medicines. *Memoires de l'Acad. des ſciences* 1731.

Mr. *Vincent Bacon* relates what he obſerved in a Man who had eat *Monkſhood*, *Napellus*, or *Aconita Spicâ Florum Pyramidali Moriſon. Prælud. Bot.* in a Sallad dreſt with Oil and Vinegar, after a Supper of Pork. Immediately after eating the Sallad, the Man felt a tingling Heat, which did not only affect his Tongue, but his Jaws, ſo that the Teeth ſeemed looſe; and his Cheeks were ſo much irritated, that the People about him, nay even his Looking-glaſs, could ſcarce perſwade him that his Face was not ſwelled to twice its proper Size. This tingling Senſation ſpread itſelf farther, till it had taken hold of his whole Body,

Body, eſpecially the Extremities. He had an Unſteadineſs in the Joints, eſpecially of the Knees and Ancles, with Twitchings upon the Tendons, ſo that he could ſcarce walk acroſs the Room; and he thought that in all his Limbs he felt a ſenſible Stop or Interruption in the Circulation of his Blood, and that from the Wriſt to the Fingers Ends, and from the Ancles to the Toes, there was no Circulation at all: But he had no Sickneſs, or Diſpoſition to vomit, till, ſuſpecting himſelf to be poiſoned, he drank a large Quantity of Oil, not leſs than a Pint in all, and after that he loaded his Stomach with *Carduus-Tea* till he vomited; and though he threw up the greateſt Part of his Supper, yet his Symptoms ſtill increaſed. His Head grew giddy, and his Eyes miſty and wandring. Next, a Kind of humming or hiſſing Noiſe ſeemed continually to ſound in his Ears, which was followed by Syncopes. Some Spirit of Hartshorn, being poured into his Mouth, rouzed him a little, and ſet him firſt a coughing, and next a vomiting. Being plied with *Carduus-Tea*, he vomited ſeveral Times more, but ſwooned often between the Times of Reaching, notwithſtanding that forty or fifty Drops of *Sal Volatile* and *Tinctura Croci* were given in a Glaſs of Wine after each Time of

Reaching.

Reaching. At length he began to find a Working downwards, which was followed by a Stool; after which he vomited two or three Times more, and then ſaid, his Head was ſo heavy, and his Strength and Spirits ſo exhauſted, that he muſt needs ly down. His Pulſe was then a little returned, tho' very much interrupted and irregular, ſometimes beating two or three Strokes very quick together, and then making a Stop of as long or a longer Time than the preceding Strokes altogether took up. Having obſerved that what he had laſt vomited was little more than the pure *Carduus-Tea*, Mr. *Bacon* gave him a Draught made of *Aq. Epidem. Theriac. Androm. Conf. Alkerm. &c.* and gave Orders to make him ſome Sack-Whey to drink between Whiles, ſometimes alone, and in Caſe of great Faintneſs, with ſome of the above-nam'd Drops. He lay awake, tho' ſtill, an Hour or two; but being very cold and chilly, had a great deal of Covering laid on him, and then found a kindly Warmth come over his Limbs, which was ſucceded by a moderate Sweat, and then a quiet Sleep of four or five Hours, from which he awaked very much refreſhed. Next Day in the Forenoon he was much amended, and was capable of anſwering Queſtions with regard to Strength, his Senſes never

never failing him but during the Swoonings. In three Days he was quite well.

A Woman, who had eat a little of this Sallad, felt and complained of the ſame Symptoms, but in a leſs Degree than the Man. She would not be prevailed on to vomit, and remained longer out of Order. *Philoſ. Tranſact. Numb.* 432. § 111.

Mr. *Queſnay* in his *Eſſai phyſique ſur l'oeconomie animale*, *p.* 87, infers, from the Effects of Heat upon Oils, how much the Nature of oily Medicines may be changed in preparing them, according to their being longer or ſhorter heated or boiled; and therefore that Surgeons ſhould have a particular Care to adapt them by this Means to the various Caſes for which they are to be applied.

Dr. *Morgan* (*Mechan. Practice of Phyſick*, *Prop.* vii.) gives it as his Opinion, that the mechanical Effections of Medicines may be reduced to theſe ſix. 1. Repletion and Depletion. 2. Rarefaction and Condenſation, or Heating and Cooling. 3. Solution or Fluxilization, and Olefaction or Inſpiſſation. 4. Derivation and Revulſion. 5. Conſtriction and Relaxation. 6. Stimulation and Pacification.

Dr. *Neuman* Profeſſor of *Chemy* at *Berlin*, having related to the *Royal Society* of *London*

London his Remarks on the hard cryſtalliform Subſtance found in the Oil of *Thyme*, and other Plants, affirmed it to be ſo like to *Camphire* as to deſerve that Name. (*Vid. Tranſ. Num.* 389. § 2.) Mr. *Brown* Chemiſt of *London*, very ſoon after (*Num.* 390. § 2.) made Remarks on Dr. *Neuman*'s Paper, and mentioned ſeveral Experiments, by which it appeared that common or oriental Camphire differed conſiderably from that cryſtalliform Subſtance, which Mr. *Brown* chuſes to call *coagulated Oil of Thyme*, and thinks the Name of *Camphire* improper. Dr. *Neuman* (in *Num.* 431. § 2.) acknowledges the Differences between theſe Subſtances, but ſtill argues, that it is as proper to give the Name of *Camphire* to thoſe cryſtalline Bodies in Oils, as it is to reduce Metals, Salts, *&c.* under the ſame Claſſes.

Mr. *Boulduc* has given much the ſame Deſcription of the Manner of making *Epſom-Salt*, as Mr. *Brown* had done in *Philoſ. Tranſ. Num.* 377. § 10. and *Num.* 378. § 11. to wit, that it is the Salt which cryſtallizes after boiling to a due Conſiſtence the *Bitterns*, which is the Liquor remaining in the Salt-Pans after the Sea-Salt for common Uſe is all ſeparated. *Mémoires de l'Acad. des ſciences* 1731.

Mr.

Mr. *Boulduc* also describes *Seignette's Sal Polychrest*, which has been long esteem'd in *France*; it is a *soluble Tartar* made with *Sal Kali*, instead of *Salt of Tartar*. *Ibid.*

The Method hitherto employed for making *Tartar* or its Crystals *soluble*, has been by saturating them with an *Alcali Salt*; but now Messrs. *Grosse* and *du Hamel* have shewn, that all Lime, Chalk or Earth that is dissolvable by Vinegar will serve for making *Tartarus solubilis*. *Histoire & Memoires de l'Acad. des sciences* 1732.

Mr. *Homberg*, by dissolving *Borax* in Water, into which he poured Oil of Vitriol, and then distilling this Mixture, obtain'd his *quieting Salt*. Mr. *Geoffroy* has lately taught us an easier Way of preparing it; for instead of sublimating, he evaporates the Liquor to the proper Consistence, and then allows it to crystallize; which Crystals answer all the Characters of the sublimed Salt. *Ibid.*

The common Opinion is, that all the animal Liquors, excepting Chyle and Milk, are of an alcalescent Nature; but Mr. *Quesnay* (*sur l'oecon. anim. p.* 144.) affirms, that "our gelatinous Liquors contain a very a-"cescent Salt capable of resisting a Heat "of 200 Degrees. The Proof of which,

"*says*

" *says he*, offers itself daily to every one. " Who is it who has not remarked, that " Broath made with Flesh well freed from " Fat, when corrupted, becomes as sowr " as Verjuice?"

The Foundation on which Mr. *Quesnay* builds his Doctrine concerning animal Liquors, is the Separation of Milk into its oily, cheesy and watery Substances, by which, he says, *p.* 165, the Genealogy of our Humours begins. In the Blood he remarks, 1. The albuminous Juices, 2. The fatty, 3. The gelatinous, 4. The bilious, And 5. The watery Liquors. Which, according to him, comprehend the four predominant Humours of the Ancients. Their *Blood* being the oily or fat Part of the Chyle. Their *Bile* is the same with the saline-sulphureous Part of that Oil. Their *Melancholia* or *black Bile* takes in his albuminous and gelatinous Liquors, which is the caseous Part of the Chyle, and the *Pituita* is the watery.

Mr. *Hunauld* has the following Observations on the Fat of the Body: 1. That tho' Fœtuses and Children have much Fat under the Skin, yet they have only a small Piece or two (*Pelotons*) at the Base of the Heart, whereas even lean adult Bodies have Fat all round the Base, on the Vessels that go out

of

of the Heart, and accompanying the larger coronary Veſſels, and at the Point of the Heart. 2. That the *Omentum* of very young Children has no Fat, and their Meſentery has very little. 3. That in many People the Fat under the Skin is exhauſted, while the Bowels are overcharged with it. 4. According to him, the exterior Part of the *Tunica cellularis* is the firſt filled with Fat, and the laſt emptied of it. From which, and ſeeing *Aponeuroſes* and Membranes ſpread over ſo many Muſcles, he concludes, the common Opinion of Muſcles being lubricated by the Fat, to be ill founded. *Hiſtoire de l'Acad. des ſciences* 1732.

The common Opinion concerning the Oſſification of Bones is, that they are firſt Cartilages, which, by Preſſure, and the Addition of an Oſſifying Juice, are gradually hardned into Bone. Dr. *Nisbet*, in his *human Oſteogeny*, undertakes to demonſtrate, "that the Notion of all, or any Bones be-"ing originally cartilaginous, is without "Foundation in Nature."

1. He obſerves, That ſeveral Bones are formed between Membranes, without the Appearance of any Cartilage. He is ſo juſt however to thoſe who differ in Opinion from him, as to allow (*p.* 15.) that ſome of theſe which he calls Membranes are ſo like

to Cartilages, that no leſs an Anatomiſt than *Kerckringius* affirms them poſitively to be Cartilages; and, *p.* 39, ſays, "We find "moſt of theſe Bones (formed in Mem- "branes) even when their Oſſifications are "far advanced, to be either ſo exceeding "thin, or very ſmall and ſlender, that a "cartilaginous Subſtance of their Size "could not have much more Solidity, than "the Membranes between which thoſe "Bones are produced."

2. The Doctor, ſuppoſing the Favourers of the common Opinion to know nothing of Liquors circulating in Cartilages before and while they oſſify, and conſequently to believe that no other ſolid Particles form Bones than what were in the Cartilages formerly, refutes them, *p.* 30, from the Bulk of the Part not having been greatly diminiſhed in oſſifying, the Bulk and Weight of all animal Subſtances, except Bone, depending indiſputably much more on their fluid than ſolid Parts. And, *p.* 33, from Bones, when burnt, leaving a greater Quantity of Earth than Cartilages do.

3. Cartilages are often harder, and Bones are ſofter than ordinary; but our Author, *p.* 25, never found any Particles or Fibres in a middle State between Bone and Cartilage, and therefore concludes the ſofter Sub-

ſtance

ſtance not to be gradually tranſmuted into the harder.

4. In Anſwer to the Experiment of ſteeping Bones in Vinegar, whereby, it has been ſaid, they may be brought to a cartilaginous State; Dr. *Nisbet* tells us, *p.* 31, that if Bones are ſteep'd long enough, and the Vinegar is often enough changed, Bones may be reduced to a ſpongy Subſtance, which is very different from Cartilages.

The Doctor's own Opinion of Oſſification is, (*p.* 27.) that in the Blood, or a Fluid ſecreted from it, there is an oſſifying Juice conſiſting of Particles which are not apparent; that (*p.* 17, 25.) when ever Nature deſigns an Oſſification between Membranes, or within a Cartilage, ſhe (*ſome Cauſe or other*) occaſions a more than uſual Afflux of Fluid, which diſtends ſo much the Veſſels which were before inviſible, as to make them capable of receiving the red Globules of Blood, which is always to be ſeen near to where Oſſification is begun. In this Blood (*p.* 18.) gritty bony Particles are to be felt by the Point of a Knife, which (*p.* 28.) have been formed by the Attraction and Coheſion of the Particles of the oſſifying Juice obſtructed, along with the other groſſer Fluids in the Beginning of the Veſſels, prepared to receive refluent Juices. "The

" Blood being capable of forming fine " Membranes, the membranous Parts of " a Bone, which act as a *Gluten* to keep " theſe Particles and Fibres together, if " there be any ſuch, that do not ariſe from " the Coats of its Veſſels, are produced by " a Coheſion round the cretaceous Par- " ticles of a Part of the Fluid, in which " they were generated and contained." Thus, (*p.* 10, 38.) the Membranes or Cartilages ſerve as a Bed between, or within which the bony Particles are depoſited or ſhoot; but (*p.* 21.) without any Intermixture of the Particles of the Bone and Cartilage, or Continuation of the Fibres of one Subſtance to thoſe of the other, as, *ſays he*, is evident in Cartilages containing Bones kept long enough in Water, and then ſlit; for the Bone will, as ſoon as the large Veſſels that enter its Subſtance are divided, ſlip as eaſily, if not eaſier, from it, than an Acorn does out of its Cup: And there is a Smoothneſs and Poliſh of the Parts of both Cartilage and Bone, which ſhew there is no Conjunction or Union of the Fibres of the two Subſtances. While the Bones are increaſing within Cartilages, (*p.* 34, 35.) the Cartilages are extended and ſpread out, by which, with the Preſſure which they ſuffer, and the great Influx of various Fluids, and the

the nutritious Matter being hindred to flow freely into them, they decreaſe continually, and at laſt may truly be ſaid to be entirely deſtroyed.

Mr. *Weitbrecht* has deſcribed and delineated a Ligament, which had not been obſerved by Anatomical Writers, ſtretched from the poſterior Part of the anterior Extremity of each *Clavicle* behind the *Sternum*, to the ſame Part of the other *Clavicle*, which makes the Articulation of the *Sternum* and Clavicles ſtronger. *Comment. Acad. ſcient. Petropolitan. Tom.* IV. *p.* 255.

Mr. *Weitbrecht* has alſo deſcribed and painted ſome Bones and Muſcles of the Hand more accurately than is to be found in other Books: What Corrections he has made will not admit of being told in fewer Words than the Author has uſed. *Ibid. p.* 234.

The Improvements made by Mr. *Albinus* in his *Hiſtoria Muſculorum*, will as little allow of an Abridgment, and therefore we muſt refer to the Book itſelf. We cannot but regret that he has given us no more Plates than four, repreſenting the Muſcles, Ligaments and Bones of the Hand, which are moſt accurate and elegant.

Dr. *Morgan*, in his *Mechanical Practice of Phyſick*, *Prop.* XII. repeats the Objections

ctions he had made in his *Philoſophical Principles of Medicine*, to muſcular Contraction being owing to the Influx of a Fluid of the Nerves into the muſcular Fibres. The principal of theſe are, 1. The Veſicles in an animal Body being all diſtractile, ſuch a Fluid would diſtend the Veſicles of the Muſcles in every Direction alike, and conſequently, by ſuch influx, Muſcles would be made longer, inſtead of being ſhortned, as they really are. 2. In accounting for the Motion of the Heart, thoſe who would have it to depend on the animal Spirits, are, *ſays he*, brought into the Abſurdity of making the Secretion of the Brain to depend on the Contraction of the Heart, and the Contraction of the Heart to depend on the Secretion of the Brain, which is running Things in a Circle without any Cauſe. Or ſuppoſe theſe two to be ſet at firſt miraculouſly in Motion, yet the Reſiſtances, that would be met with, would neceſſarily put ſoon an End to that Motion. Weights and Springs, which act by their conſtant uniform Force of Gravity and Elaſticity, are the only Cauſes of continuing Motion in a reſiſting Medium. To Elaſticity then it is he aſcribes the Motion of Muſcles, as is more fully explained in his Principles. We wiſh the Doctor would impartially try

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the Application of the Objections he has made to the common Opinion, likewise to his own Doctrine.

In *Schol.* 1. of this *Prop.* XII. he particularly attacks *Boerhaave*'s Arguments in favour of animal Spirits, which, he thinks, the Professor gives up, by acknowledging that they cannot be exhibited to any of our Senses.

In *Schol.* 2. He laughs at the Opinion of Secretion being only owing to the Laws of Circulation, and thinks some Concoction or Fermentation necessary. Nor will he allow that all the Liquors secerned have first entred the Blood-vessels, insisting still, as he had done formerly, that the Urine passes from the Stomach to the Bladder, without entring into the common Course of the Circulation.

Dr. *Morgan* (*Mechan. Pract. Prop.* VI.) endeavours to shew that Dr. *Juryn* (*Dissert. de motu aquarum fluentium*) "has "confounded three perfectly different and "distinct Laws of Motion, namely, the "Law of communicating Motion by Im-"pulse, the Law of Gravity in general, "and the particular Law of Pressure in "Fluids;" and then examines the Paradox, concerning the Circulation of Liquors in Animals, advanced by Dr. *Juryn* in that

Diſſertation, to wit, that the *Momentum* or *Impetus* of the Blood is greater at the Extremities of the evaneſcent Arteries than at the Heart. The contrary of which, Dr. *Morgan* thinks is clearly demonſtrated by the greater Thinneſs of the Coats of the ſmall Arteries than of the large ones, and from the Capacities of all the Branches of every Artery being ſo much greater than of the Trunk itſelf, while the ſame Quantity of Blood paſſes through the Trunk and Branches in the ſame Time.

In *Schol.* of *Prop.* V. he roughly criticizes Dr. *Robinſon*'s Laws of Motion in Fluids, and afterwards attacks the Doctrine which Dr. *Robinſon* has borrowed from Sir *Iſaac Newton* concerning the Acid in the Air, which they ſuppoſed neceſſary for the Life of Animals, and to preſerve the Action of Fire and Flame. (See our *Vol.* I. *p.* 340.) Dr. *Morgan*'s principal Objection to this Doctrine is, that Acids extinguiſh Fire, and acid Vapours are more ſuffocating and deſtructive than any common watery Fume or Vapour; and Acids cannot efferveſce with the Blood; nor do they increaſe, but rather diminiſh Heat.

Our Author's Opinion of the Uſe of Air to Fire and Animals is, that it ſerves as a proper exhaling Medium to receive and carry

ry off thoſe copious Diſcharges of humid *Effluvia* or moiſt Vapour, which all living Creatures, and all combuſtible Matter under the Action of Fire, are inceſſantly emitting and throwing out, and conſequently, for want of ſuch an exhaling Medium as that of the Air, thoſe vaſt Quantities of humid Vapour being thrown back, and not diſcharged or carried off, the Life of Animals, and the Action of Fire muſt ſoon be ſuffocated and extinguiſhed, after the ſame Manner, and by the ſame ſort of mechanical Neceſſity.

Anatomiſts in their Figures and Deſcriptions of the *Brain* only repreſent the Cavities that are ſeen upon ſeparating the Hemiſpheres, and taking away the *Corpus calloſum*, without obſerving that the *Crura fornicis* ſink down, and then turn forwards on each Side of the *Medulla oblongata*, in Cavities which are extended far forwards, under the commonly-known anterior Ventricles. In theſe inferior Cavities the *Crura fornicis* are of a beautiful Form, reſembling a white Silk-worm, or *Sea-horſe*; on which Account they were called *Hippocampi* by *Julius Cæſar Arantius*, who is the only Author who has given any Deſcription of them, till lately Mr. *Du Vernoy* has revived them, by an exact Deſcription and Delineation.

Mr.

Mr. *Du Vernoy* alſo obſerves, that the *Septum lucidum* between the anterior Ventricles has a Cavity between the two *Lamellæ* of which it is compoſed, in which he has often found Water, and that the internal Side of the *Septum* is made rough, by a great many ſmall Grains and *Papillulæ*. *Comment. Acad. Petropol. Tom.* IV. *p.* 130.

The *French* Anatomiſts have of late diſputed, whether or not the Heart is ſhortned in its *Syſtole*, tho' all allow that it is then ſtraitned.—— In Diſſections of living Creatures, the Motions of the Heart are ſo quick, convulſive and irregular, that it is ſcarce poſſible to determine this Queſtion by them.— If it is ſaid, that the longitudinal Fibres contracting will make the Heart ſhorter; it may be anſwered, that the tranſverſe Fibres, being much ſtronger than the longitudinal, may prevent their Action.——The Valves at the Orifices of the Ventricles of the Heart being evidently ſtretched towards the Point of the Heart in its *Diaſtole*, when the Blood ruſhes into the Ventricles, and theſe Valves being raiſed towards the Baſe of the Heart in its *Syſtole*, to prevent the Blood from returning into the Auricles; which Motions of the Valves ſeem to depend on the Relaxation, and on the ſtretching of the tendinous Cords

Cords, by which the Valves are connected to the Sides of the Ventricles, appears to be one of the ſtrongeſt Arguments for the Heart being ſhortned in its *Syſtole*, eſpecially that theſe Motions of the Valves can be ſeen, by alternately raiſing and letting fall the Point of a Heart filled with Water, and held with the Baſe upwards. But even this is not concluſive; for in making the laſt-mentioned Experiment, the Motions of the Valves are the ſame, when the Sides of the Ventricles only are preſſed without the Point being raiſed or depreſſed. —— Nor is there any Conſequence to be drawn in favour of the Heart's being lengthned in its Syſtole, from its Pulſation felt at that Time on the Ribs; becauſe that Pulſation may as well be owing to the Heart's being raiſed by the ſtretched, diſtended Auricles and Arteries, as to the increaſed Length of the Ventricles. *Hiſt de l'Acad. des ſciences* 1731.

According to Mr. *Queſnay* (*l'oecon. animale*, *p.* 227.) the Motions of the Heart and the Circulation of the Liquors depend on the Motion of the Lungs, which ſending the Blood forcibly into the left Auricle, revive and increaſe its Elaſticity and Contraction by this Shock, which the Auricle communicates to the Ventricle, which affects the Arteries in the ſame Way; and

theſe

theſe do the ſame to the Veins which act upon the right Auricle, and that upon its Ventricle: And thus the Circulation is continued.

Mr. *Lindern* Phyſician at *Strasburg* relates two Obſervations, which contradict the Doctrine of violent Trituration, ſaid to be performed by the Stomach in Digeſtion. 1. A Dog having ſwallowed a Dice, vomited it eleven or twelve Hours after; when the bony Part of the Dice was much diminiſhed, but the Pins of Wood on which the Spots are marked were entire, and ſtood out a conſiderable way from the Bone. 2. Three Stomachs of Swine were cruſted ſo thick over their interior Surface with a ſtony Subſtance, that all their Cavity was filled, except a Canal in the Middle, of about an Inch diameter: Notwithſtanding this, the Fleſh of the Creatures was fair and ſound, and ſold well. *Hiſt. de l'Acad. des ſcien.* 1732.

Ruyſch (*Adverſ. Dec.* 3. *Tab.* I. *Fig.* 4, 5, 6, 7.) painted the meſeraic Arteries and Veins as having different Courſes in the Diſtribution of their Branches in the Inteſtines. Dr. *Albinus* (*Diſſert. de arter. & ven. inteſtin.*) attributes this Miſtake to *Ruyſch*'s having injected the Arteries at one Part of the Inteſtines, and the Veins at another; and by a Figure repreſenting the internal

cellular

cellular Membrane of the *Ilium* with both Arteries and Veins injected, ſhews their Courſes to be the ſame.

Mr. *Du Vernoy* is of Opinion, that the *Valvulæ conniventes* of the Inteſtines are formed by the arched Veſſels and Fat in the internal cellular Coat, and covered by the villous or nervous Coat. *Comment. Acad. Petropol. Tom.* IV. *p.* 192.

Every Body knows the many Opinions which have been given concerning the Uſe of the Spleen. Mr. *Du Vernoy* has added one more to the Number. From obſerving a large empty Space, near the Spleen, in the Abdomen of a dead Body; the proportional Largeneſs of its Blood-veſſels, and the Structure of the Spleen analogous to that of the *Penis*; he concludes the Spleen in a living Perſon to be ſubject to Inflations like a Bellows: But how it is thus to be moved, or to what Purpoſe, he does not tell us. *Ibid. p.* 156.

Dr. *Rega*, in his *ſecond Treatiſe* on *Urine*, mentions the Opinion of ſome modern Authors, who imagine that our Drink paſſes through the Coats of the Stomach and Bladder, and not in the ordinary courſe of the Guts, Lacteals, *&c.* when it is ſo quickly evacuated by Urine, as it is obſerved to be after drinking ſeveral Mineral Waters

Waters and other Liquors. He shews this to be no new Opinion, it having been mentioned by *Hippocrates* and *Asclepiades*; and then he endeavours to prove, by an easy Calcul of the Quantity of Urine secerned in the Kidneys, that they are capable of furnishing all the Quantity observed at any Time. And lastly, he mentions the Fullness and greater Frequency of the Pulse after drinking these diuretick Liquors, as a Proof of their being mixed with the Blood.

Dr. *Morgan* (*Mechan. Pract. p.* 246.) after several Arguments taken from the *Chlorosis*, and other Symptoms which appear after Obstructions of the *Menses*, and observing that Blood-letting does not supply this natural Evacuation, concludes that the *Menses* are not designed only for evacuating a superfluous Quantity of arterious Blood, but that there is then a very different and very independent Secretion, or a Derivation of a certain excrementitious and redundant Lymph or Serum, from the membranous Cells and Ventricles of the Glands in general, but chiefly from those Parts of the *Membrana cellulosa*, which are more directly and immediately connected with the Kidneys, *Uterus* and *Ovarium*.

Dr. *Neufville*, in his *Dissertation* on the *Allantois*, § 10, affirms, that a Liquor injected

jected by the human *Urethra*, after the Bladder is blown up, will come out at the *Urachus*; as it will, *he says*, likewise do, upon gently pressing a Bladder filled with Liquor, while the *Urethra* is tied. He also informs us, that Mr. *Albinus*, Professor of Anatomy at *Leyden*, shewed his Students the *Urachus* of an Adult, which was pervious, and allowed the Urine to pass an Inch from the Bladder. And (§ 24.) that Mr. *Albinus*, in 1730, shewed the *Allantois* of a human Fœtus about seven Weeks old, loosely connected by small Fibres, and placed betwixt the *Amnios* and *Chorion*, exactly where the *Placenta* adheres to the *Chorion*; it was like an oblong Bladder, and much more capacious than the Bladder of Urine. The *Urachus* likewise appeared distinctly in the umbilical Rope towards its Side, like a small Thread, and terminated in the *Allantois*.

Dr. *Hunauld*, Royal Professor of Anatomy of *Paris*, has communicated some Thoughts on the Operation of the *Fistula lacrymalis*, and proposes that no Tent should be put into the Perforation of the *Os unguis*, because the Tears will of themselves keep it open, and the Tent, by its Pressure and Irritation, may occasion Inconveniencies. *Philosoph. Transact. Numb.* 437. § 5.

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The itinerant Oculiſt Dr. *Taylor* (in his Treatiſe on the Diſeaſes of the *Cryſtalline Humour* of the human Eye) ſeems to aim at ſomething new in the Operations he deſcribes, but expreſſes himſelf in a Manner that makes us ſuſpect we may miſtake his Meaning: We ſhall however for once try our Skill in explaining profoundly obſcure Authors.

In couching a *Cataract* or opack *Cryſtalline*, he makes a ſmall Puncture with a Lancet, through the Coats of the Eye, in the ordinary Place of piercing with a Needle in this Operation; then introducing his Needle at this Puncture, he directs its Point to the lower Edge of the *Cataract*, and raiſing the *Cataract* a little with the Side of the Needle, he obſerves whether it moves directly upwards, without being turned forwards or backwards. If the *Cataract* thus moved is neither preſſed nearer to, nor farther from the *Iris*, he draws back the Needle ſome Way; and as ſoon as the *Cataract* deſcends to its former Situation, he puſhes the Needle quickly into it, and breaks its lower Edge, by forcing the Needle through it, and ſome little Way into the Subſtance of the vitrous Humour. When this is done, he draws the Needle back again, and then directs its Point to the upper Part of the *Cataract*, upon

on which he presses in different Directions, till he sees, by the perpendicular Motion of the *Cataract*, that the Needle is right placed, when he uses more Force to thrust the alter'd *Crystalline* out at the Aperture already mentioned to have been made in the lower Part of its *Capsula*. When ever he sees the *Cataract* passing through this Opening, he brings back his Needle to it, and pushes the *Cataract* into the divided Part of the vitrous Humour, and then takes his Needle out of the Eye.

In what he calls the *shaking Cataract*, or where the alter'd *Crystalline* has got out of its *Capsula*, and floats in the aqueous Humour; the Operation, according to him, is much the same as in the *true Cataract*; only that the Part of the former Operation, whereby the *Capsula* of the *Crystalline* was opened at its lower Edge, is omitted, and the Needle must be placed farther forward in the Eye, in depressing the *Cataract*.

The *false Cataract*, according to Dr. *Taylor*, is the *Crystalline* reduced to a fluid State with an opack *Capsula*, in which he advises first to perform the same Operation as in the *true Cataract*, and afterwards to separate the *Capsula* all round from its Adhesions with the *Ligamentum ciliare*, that it may also be depressed into the vitrous Humour.

The *Glaucoma* is said by our Author to be the *Crystalline*, with its *Capsula* become opack and enlarged in its Volume; for removing which, he proposes the Separation of the *Capsula*, with its included *Crystalline*, and their Depression into the vitrous Humour, in the same Manner as was proposed for the *Capsula* of the *false Cataract*.

After these Operations, Dr. *Taylor* drops a Mixture of the Tincture of *Bals. Peruvian.* with warm Water, into the Eye; and then applies, upon the Eye, a Cataplasm made of some Drops of the Mixture, with *Pulp* of *Cassia*. This Cataplasm is to be renewed every four Hours of the first two Days, each Time fomenting the Eye, half an Hour, with a spirituous Fomentation in which there is *Camphire*. He then gives free Motion to the Eye-lids, but keeps a Shade over the Eyes for some Time.

The *Cæsarean Operation* is recommended by several Authors, and some Examples have been recorded, of the Mother having been saved by it; notwithstanding which, Women are frequently allowed to die with their Children buried in their Womb, without this Attempt being made for saving either. To encourage Practisers to do their Duty, by performing what Art directs for saving Patients in desperate Circumstances, Mr. *Hel-*

Helvetius communicates to the Academy of Sciences at *Paris* a well-atteſted Hiſtory of a Woman recovering after the *Cæſarean Operation* had been performed upon her by a Midwife. *Hiſt. de l' Acad. des ſcien.* 1731.

Mr. *Petit* the Surgeon, in examining all the different Methods employed by Surgeons for ſtopping Hæmorrhagies, aſſures us, that in each of them a Piece of clotted Blood is contained in the Veſſel, which ſerves to keep the Blood from eſcaping after the Effect of the Medicine firſt employed ceaſes. Where *Abſorbents* or *Aſtringents* are uſed, there is, *he ſays*, not only a cylindrical Piece of clotted Blood in the Veſſel, but there is a Covering of it on and round the Orifice of the cut Veſſel; which cylindrical Form makes it eaſily puſhed out at the Extremity of the Veſſel; and therefore the Hæmorrhagy is in Danger of returning, when it is ſtopped by ſuch Medicines.—*Cauſticks* have much the ſame Effects, only the Covering on the Extremity of the Veſſel is firmer by the ſolid Parts being confounded with the clotted Extravaſation.—When a *Ligature* is uſed, there is no clotted Covering, and the internal Plug is of a pyramidal Figure, the ſmaller Extremity being neareſt to the Ligature; therefore it is with Difficulty that ſuch a clotted Piece can

be pushed out. Besides this Advantage, the Sides of the Vessel, which are brought to be contiguous by the Ligature, will probably grow together; and on both these Accounts, there is much less Risk of a fresh Hæmorrhagy, after tying Vessels, than in the other Methods above-mentioned.—— *Compression* rightly applied, to wit, on the Sides of the Vessel, renders the clotted Plug of such a Form as cannot easily escape at the narrow Orifice; and a large Surface of the Sides of the Vessel being made contiguous, they will grow sooner and more firmly together than in any other Way: For which Reason, and the saving both Pain to the Patient, and Loss of Substance of the Stump, he prefers *Compression* to all the other Methods. *Memoires de l' Acad. des scien.* 1731. In Proof of the Effects of coagulated Blood stopping the Efflux of Blood from large Arteries, he relates two Histories; in one, the Artery was ossified; and in the other, it lay in a bony Groove: So that in both, it must have been a Plug which prevented the Hæmorrhagy. He endeavours to prove, that the *Caillot* or *Plug* is stronger and firmer when formed of coagulated Lymph, than when it is composed of red Blood. *Ib.* 1732.

For executing the Compression right, after Amputations of the larger Extremities, he

he has contrived a Machine, compoſed of a large circular Belt, to be put round the Trunk of the Body, or ſuperior Part of the Member, which is to ſuſtain the Bandage, by Straps going from it, which are faſtned at the other End to a leſſer circular Belt that is put round the Part of the Member where the Tourniquet is commonly applied. This leſſer Belt is to have two Plates with Screws, *&c.* in the Form of his Screw-Tourniquet, deſcribed *Memoires de l'Acad. des ſciences* 1718, and now generally known, and is to ſerve the ſame Purpoſes of ſtopping the Blood during the Operation, and in the Time of each Dreſſing, and to moderate its Courſe at all other Times. From this leſſer Belt, four Straps go out, to croſs over two Plates with their Screws, as in the Tourniquet placed on the Stump. When the Operation is performed, he applies thick Bolſters of Lint on the Side of each large Artery fartheſt from the Bone, and placing the interior convex Plate of the ſmall Tourniquet on them, he ſecures it in the right Situation with the four Straps, and ſcrews down the Plate on the Bolſters and Veſſel, which being preſſed between the Inſtrument and the Bone, can allow no Blood to paſs. *Ibid.* 1731.

Dr. *Deſaguliers* has contrived a Machine

for changing the Air of the Chamber of sick People in a little Time, by either drawing out the foul Air, or forcing in fresh Air; or doing both successively, without opening Doors or Windows: A Figure, Description and Account of which are inserted into the *Philosoph. Transact. Numb.* 437. § 1, 2, 3. which we cannot abridge.

Mr. *Quesnay* (*l'art de guerir, par la Saignée*) observes, that the Effects of Blood-letting must be, *1st*, To empty the Vessels, which he calls *Depletion*. *2dly*, To take away more of some Sorts of Liquors than of others, which he calls *Spoliation*. The *Depletion* may soon be supplied by new Chyle, but this Chyle is not so soon reduced into the Nature of the Liquors taken away; therefore though the first Effect of Blood-letting may cease very soon, the second will continue longer, and is the principal. The red Globules, according to our Author, must be most affected by the *Spoliation*, because of their small Proportion to the other Liquors, and their quick Circulation in the larger Vessels; whence he infers, that the great Effect of Blood-letting is to render the Fluids more serous, and to weaken the Solids.

From considering, says Mr. *Quesnay*, *p.* 47. all the Effects of Blood-letting, it must

muſt be concluded, that there is only Place for Blooding when the Liquids diſturb the Action of the Solids, or when the Solids cauſe Diſorder in the Fluids. For when the Solids or the Liquids are found defective abſolutely, or in themſelves, the bad State of neither of them can be repaired by blooding.

It is impoſſible to make ſuch an Abridgment as our Deſign allows, of all the particular Caſes in which he examines, whether Blooding is uſeful or not; only we may in general obſerve, that there are very few Diſeaſes in which he thinks it may not be of advantage to let Blood.

Dr. *Langriſh* (*Modern Theory and Practice of Phyſick*) gives us Tables of the different Proportions of *Serum* and *Gore*, and the different Powers of Coheſion between the red Globules which conſtitute the *Craſſamentum*, as alſo the Proportions of the different Principles obtained by a *chemical Analyſis* from the *Blood*, and from the *Urine* in different Kinds of Fevers, and in their ſeveral *Stadia*.

P. 66. He tells us the Manner in which his ſtatical Experiments were made; 1. "He always took Care to bleed into a Por-" ringer as near the ſame Shape and Size as " poſſible, becauſe a larger Surface of Blood " ſhould not be expoſed to the Influence of

" the Air in one Trial than in another. " 2. All the Blood was received in one " Porringer, because he has found by Ex- " perience, that a Pound of Blood does " not separate so much Serum, when divi- " ded into several Parcels, as when con- " tained in one Vessel. 3. He always set " the Blood in a cool Place; and after it " had stood twenty four Hours, he very " carefully weighed the *Serum* and *Cruor* " separately, in order to find their diffe- " rent Proportions. 4. He took a very " thin Glass-Tube, 12 Inches long, and $\frac{1}{3}$ " Inch diameter, and having hermetically " seal'd up one End of it, he blowed it out " to an obtuse Point, about the Bigness of " a midling Pea. Now this Point being " set upon the *Crassamentum*, the Weight " of the Tube was not of itself sufficient " to press through, and but very seldom, " when filled with Water; so that his way " of trying the Cohesion of the *Gore*, was " to pour Mercury into the Tube, till it " was just heavy enough to cut its Way " through; and as the Tube was exactly " graduated, he could, by this means, very " nicely determine the Power of Cohesion " between the Globules which constitute " the *Crassamentum*."

By the Tables of Dr. *Langrish*'s statical Experi-

Experiments made on the Blood of People in acute continual Fevers, *p.* 68. compared with what he ſays of the Blood of three young Men in perfect Health, *p.* 74; it appears that in ſuch Fevers the *Serum* is in leſs Proportion, and the *Craſſamentum* is more viſcid and tenacious than in Health. The Indications of Cure from which are plain.

By the chemical Analyſis, *p.* 80, it was proved, that in acute Fevers the ſaline and ſulphureous Parts did abound more than in Health. And, *p.* 94, that the Urine was impregnated more and more with theſe ſaline and ſulphureous Principles, as the Symptoms abated upon a Criſis by Urine.

Dr. *Freind* had recommended Bleeding at the jugular Veins, in a Phrenzy coming upon a Fever, which Dr. *Langriſh*, *p.* 131, endeavours to prove rather to be hurtful: 1. Becauſe of the Ligature's ſtopping the Blood ſome Time. 2. Becauſe opening the external Jugular cannot make a Revulſion from the internal Parts; ſince not only the Reſiſtance to the Blood in the common Trunk of the *Carotid* is thereby diminiſhed, but alſo the Reſiſtance to that which comes out of the Heart is alſo diminiſhed, which will therefore ſend more by that common Trunk, and conſequently as much

as

as formerly by the internal Carotid. 3. After the Orifice of the Jugular is ſhut, there is ſome Reaſon to believe that the Blood continues to flow more by the ſuperior Branches ſome Time, which will do Harm. 4. He thinks the Caſes mentioned by Dr. *Freind*, for proving his Opinion, either do it not, or can be turned againſt him.

By our Author's Experiments in intermitting Fevers, *p.* 229, the *Craſſamentum* of the Blood is not ſo viſcid and tenacious; neither is the *Serum* ſo bilious, ſaline and acrid, as in acute continual Fevers; and the red Globules abound more, and the *Cruor* is more viſcid and tough in *Quotidians* than in *Tertians*, and in *Tertians* than in *Quartans*.

The *Epidemick Fever*, deſcribed by Dr. *Douglas*, ſeized a half of the Inhabitants of *New-England*, and killed one in thirty five; in ſome Places one Sixth, one Fourth, or one Third of the Sick died.——— The greateſt Number of thoſe labouring under this Epidemic Diſeaſe, after the common Symptoms of a Fever, had Swelling, Pain, and white Specks in the *Uvula* and *Tonſils*, and a diſtinct, red, miliary Eruption over all, (or a breathing Sweat that ſmelled as the Eruption did) which was at the Height the fourth Day; after which it itched and

ſcaled

ſcaled off, and the Specks ſlough'd off from the ſubſiding *Fauces*. They generally did well.—— A worſe Kind of this *Fever* was accompanied with a low unequal Pulſe, Proſtration of Strength, Deſpondency, colliquative Vomiting, Purging or Sweats, chop'd *Tonſils*, with brown or livid Spots; the Eruption darker-coloured, or appearing and diſappearing; *Ichor* or *Pus* coming by Mouth or Noſe from Parts out of Sight; mucous *Exuviæ* ſloughing off the Tongue, *OEſophagus* or *Bronchia*. Many thus affected died the ſixth or ſeventh Day.—— In the worſt Sort, the Pulſe and Strength were ſtill lower, the Colliquations were greater; and the Sick had a ſinking Pain at the Stomach, *Stupor*, *Delirium* or Convulſions, and an intolerable *Fætor*. The few thus ſeized died the firſt, ſecond or third Day.

This *Fever* was ſeldom too high, and the Patients generally recovered when left to Nature, with a temperate *Regimen*. Evacuations, particularly Blood-letting, haſtned Death, or retarded the Cure. Hot Cordials alſo did Hurt. Snakeroot-Tea, or Sp. C. C. and a little Wine ſupported the faint and weak, and promoted the ſalutary breathing Sweats. Profuſe Sweats and Diarrhœas were ſtopt by *Ol. Cinam. Decoct. alb. Elixir.*

Elixir. Vitriol. and toaſted *Rhubarb. Calomel*, which made the Evacuation they bore beſt, and Gargles of *Tinct. Myrrh* and *Aloes* helped off the Sloughs, and kept the Throat moiſt.——This *epidemick Diſeaſe* was followed in ſome with Diſcolourings, Hæmorrhagies, *&c.* like thoſe in the Scurvy, which were cured by Milk-diet, *Peruvian Bark* and *Elixir Vitrioli.* In others with Tumors, which reſolved with mercurial Plaiſters and Purging, but ſuppurated, with Cataplaſms; and, when ſuppurated ſpread by Digeſtives, but cured with ſpirituous drying Applications. The nervous Symptoms, ſuch as hyſterick Ails, Melancholy, Fatuity, *&c.* remaining with others, were ſoon removed by a reſtoring Diet.

Dr. *Cohauſen* in his Book, entituled, *Archeus Febrium Faber & Medicus*, recommends the *Quinquina* or *Jeſuits Bark* in intermitting Fevers, but mentions ſeveral Rules to be obſerved before it is given, while it is uſed, and after taking it. He condemns the Uſe of Purgatives as Preparatives for the Bark, and recommends Emeticks, eſpecially in meſenteric Fevers, where the *primæ viæ* are ſtuffed. He recommends *the Bark* to be given immediately after the aguiſh Paroxyſm, and to repeat the Doſe every four Hours; and is of Opinion it has

better

better Effects when taken with a bitter ſtomachick Wine than in Pills, and it is ſtill more effectual when ſome Green Tea is drank with it. While *the Bark* is uſed, and in the Intervals of Paroxyſms, he ſays, Exerciſe is of great Uſe.

Though our Author is very fond of *the Bark* in the Cure of intermittent Fevers, he cautions Practiſers to be very careful not to give it to all Patients, or at improper Times; becauſe, though it may put off the Fever, it occaſions Swellings, Dropſies, Pains of the Belly, Obſtructions of the Bowels, and a great many other Diſeaſes, (of which he gives ſeveral ſtrong Examples) that are more dangerous and worſe to cure than the Ague is. The beſt Method, he ſays, to remove theſe bad Symptoms, is to bring back the Fever, for which *Etmuller* recommends volatile Spirit of *Sal Ammoniac*; our Author thinks a Wine in which reſolving diuretick and deterſive Medicines are infuſed would be ſafer. He tells us, the People of *Weſtphalia* ſeldom miſs to bring back the Fever when neceſſary, by eating a high-ſmoaked Sow's Head.

Mr. *Cohauſen* is of Opinion, that the continued remitting Fevers which are periodical in their Remiſſions, are of the ſame Nature with Agues, and ought alſo to be cured

red by *the Bark*, unleſs they are of a malignant Kind, accompanied from the Beginning to the End with Coldneſs and a weak Pulſe; in ſuch Caſes, Diaphoreticks are the proper Medicines.

The *German* Phyſicians ſeem at preſent to be divided in their Opinions concerning *Blood-letting* in the *Small-Pox*, ſome ſtill adhering to the hot *Regimen*, while others recommend Venæſection as the Medicine moſt to be depended on. Dr. *Burghart* Phyſician at *Breſlaw*, in Support of his Friend Dr. *Tralles*, Phyſician in the ſame Place, his Treatiſe on the Uſe and Neceſſity of Blood-letting in the variolous Fever, proves by numerous Obſervations of the good Effects of Hæmorrhagies from the Noſe and other Parts of the Body, and Venæſection in the variolous Fever, that in a great many Caſes it is the chief or only Medicine from which the Prevention of the worſt Symptoms is to be expected, though perhaps it is not neceſſary to every Patient under this Diſeaſe. *Mantiſſ. ad Specim.* 1. *Satyr. Medic. Sileſiac.*

Dr. *Calderwood* (in his *new Method of curing the Apoplexy*) condemns the common Method of letting Blood from any Vein, giving Emeticks or ſharp Clyſters, and applying Bliſters: But inſiſts much on the

the Advantage of *Arteriotomy*; and recommends Cordials in the Cure of the Apoplexy.

Dr. *Aſtruc* has wrote a regular and compleat Account of the Origin, Nature, Symptoms, Prognoſticks and Cure of the *Lues Venerea*. In which, after examining critically all the Arguments that have been uſed in Proof of the *Lues* having been known in *Europe* before the Conqueſt of the *Weſt-Indies*, he thinks them inſufficient; and concludes, that it was brought from the Iſland *Haiti* or *Hiſpaniola* by the *Spaniards*, who being employed in the Defence of *Naples*, attacked by *Charles* VIII. King of *France*, communicated this Diſeaſe to the Inhabitants of that Country, and to the *French* Army in 1494, when it was firſt taken notice of; and therefore was called the *Neapolitan* or *French* Diſeaſe.

He thinks the Reaſon why the Inhabitants of *Hiſpaniola*, and ſome other hot Countries, had the *Lues* endemick among them, was, the Heat of the Climate, and the promiſcuous Coition of their Women even in the Time of their *Menſtrua*.

After having obſerved, that ſeveral Diſeaſes have had their Progreſs and Periods, and that the *venereal Diſeaſe* is gradually become

become more mild, our Author is hopeful that it may alſo wear out.

Dr. *Aſtruc* proves this Diſeaſe always to be communicated here in *Europe* by Infection; and modeſtly conjectures, from the Effects of its Poiſon, that it is of an acid or acido-ſaline, corroſive and fixed Nature.

It is impoſſible for us, in the narrow Bounds we are confined to, to follow our Author in his Aitiology, Diagnoſis, Prognoſis and Cure of the ſeveral *Stadia* of the venereal Diſeaſe, which he diſtinguiſhes very accurately, both when it affects the whole Body, or any particular Part of it, and when it is attended with no other Diſeaſe, or complicated with others. We ſhall only remark, that he proves the *Gonorrhœa* to affect the *Proſtata* and *Veſiculæ ſeminales* in Men, as well as the mucous Glands, and *Cowper*'s and *Littre*'s Glands, to which it is confined by ſeveral Authors: And that he prefers the Salivation by Inunction to every other Method for curing the *Lues*.

We ſhall conclude this ſuperficial Account of Dr. *Aſtruc*'s Book, with a Cenſure he makes, which we wiſh our Countrymen would ſhun to deſerve. In giving the Character of a particular *Engliſh* Writer, he ſays, *Ordine parum compoſito diſſeritur, ſaltem non ea methodo quæ lucem afferat,*

&

& quam in Anglorum medicorum operibus plerumque deſiderari dolemus.

Pudet hæc opprobria, &c.

Dr. *Morgan* (*Mechan. Pract.*) recommends ſeveral uncommon Methods of Cure in different Diſeaſes; the moſt remarkable of which we ſhall mention.

The Tincture of *Cantharides* is, according to him, *p.* 114, a Medicine that may almoſt be abſolutely depended on for checking, reſtraining and ſtopping the immoderate Flow of Urine in a *Diabetes*. He chuſes to make this Tincture, by infuſing or digeſting half an Ounce of *Cantharides* upon a Pound of the *Elixir Vitrioli*, of which Tincture, from 15 to 30 or 40 Drops may be given twice or thrice a Day, as the Symptoms may indicate; and the beſt Vehicle is the *Briſtol* Hot-well Water.

Prop. XIII. is employed in inculcating the Advantages of curing Fevers by Sweating, raiſed by low cooling Drinks in the effluent or inflammatory Fevers, and by the warmer *Regimen* in influent or nervous Fevers. In which laſt he recommends Bliſters much, eſpecially when ſoon applied; and propoſes that the bliſtering Plaiſters ſhould be left on four or five Days, or as long as they will draw off any thing.

The Cure propoſed by the Doctor, *p.* 179.

for *Intermittents*, which he assures us is much preferable to the common Practice, is to give a Vomit about an Hour after the Invasion of the cold Fit; which being wrought off, the Patient goes to Bed, and is put as soon as possible into a large and copious Sweat, to be continued, and succoured by plentiful Dilution, for six or eight Hours. This Method, three or four times repeated, scarce ever fails, he says, of curing a *Quartan*, especially if the Person afflicted use the cold Bath every Day between the Fits. But in a *Tertian*, this Method, once or twice repeated, makes commonly a Cure.

In *petechial* and *malignant Fevers* there is, in our Author's Opinion, no Hope but from Sweating, which it is impossible to raise and maintain uniformly and equally in these Cases, without the most powerful and effectual Blistering.

He esteems Sweating and loose Stools of the greatest Advantage in the *Small-Pox*; and likewise proposes it as a Cure for the *Gout*, *Sciatica*, and *Rheumatism*.

Sweating sustained with proper Diluters, is also recommended by him in dry Coughs. After the dry Cough, and Catarrh which follows it, is throughly fixed, he never found any thing effectual but giving *Calomel*,

mel, or ſome ſuch moderate Mercurial, to raiſe a ſlight and gentle Salivation.

He thinks the *Fluor albus* is the Lymph corrupted, and aſſures us the *Tincture of Cantharides* given in a pretty ſtrong Decoction of *Guajac*, has good Effects in its Cure when recent. But where this Diſeaſe is of long ſtanding and inveterate, Recourſe muſt be had to Mercurials.

P. 255, He appears to be no Friend to *Blood-letting*, making it Matter of Advice and Requeſt to all younger and unexperienced Phyſicians to be ſparing of human Blood, to ſee an abſolute Neceſſity of it before they ſpill it, *&c.*

P. 271, When *Opium*, ſays the Doctor, affects the Head or Lungs, by its volatile, æthereal Oil or Spirit, Acids, eſpecially foſſil Acids, are the proper Correctors. When *Opium* produces Sickneſs, Nauſeas, Vomitings, Spaſms, flatulent Colick Pains, and ſuch like Symptoms, by the Action of its ponderous, ſtimulating and adheſive Oil, the warmeſt Alexipharmicks muſt be uſed.

P. 278, According to our Author, the moſt effectual Medicines in ſcorbutick Diſorders are mercurial Deobſtruents. He has found the following Medicine very ſucceſsful: ℞. *Mercur. viv. Unc.* ii. *Terebinth. Drachm.* ii. *vel q. s. ad Mercur. fixandum,*

cui adde Rhubarb. Unc. i. *ſem. Cochinel. Unc. ſem. & cum Elixir. Propriet. q. s. fiat maſſa pilularis.* This commonly proves an effectual, ſafe and benign Diuretick. While it is taking, the Patient is now and then to be moderately ſweated. If the Pills ever raiſe a Salivation, the Force of the Mercury on the ſalival Glands may be eaſily prevented or reſtrained at Pleaſure, only by rinſing the Mouth pretty often in a Day with a Solution of *Camphire* in Oil of *Olives.*

P. 354, For the Cure of the *Scurvy*, he propoſes that the Patient ſhould be put into a warm or hot Bath for half an Hour or forty Minutes, till the Pores are all opened, and the Sweats are moderately raiſed and brought out: And then let him be taken out, and immediately immerſed in cold Water for half a Minute, or juſt Time enough to dip the Head two or three Times, and then taken out again and put to Bed, in order to keep up a pretty free flowing Sweat for three or four Hours, to be maintained and ſupported with any of the common warm Diluters, ſuch as Sage-Tea, Wine-Whey, Poſſet-Drink, *&c.* At the ſame Time the Parts affected may be ſlightly touched every other Night going to Bed, with the *Ung. Neapolitan.* or ſomething equivalent

quivalent, in every Ounce of which a Drachm of the prepared *Cantharides* has been mixed and incorporated, firſt reduced to the moſt ſubtile Powder. And upon this any common ſudoriſick Draught or *Bolus* may be given, to be ſupported with Diluters as before, in order to keep up a moderate breathing Sweat for the Night.

XXXVI. *A Liſt of* Medical Books *publiſhed ſince the Beginning of the Year* 1734.

A Diſſertation on the State of Phyſicians among the old *Romans*, by Dr. *Conyers Middleton*, 8vo. *London* 1734.

Remarks on Dr. *Middleton*'s Diſſertation, tranſlated from the *Latin* of *P. W.* M. D. 8vo, *London* 1734.

An Account of *Alexander Trallian*, one of the *Greek* Writers that flouriſhed after *Galen*; ſhewing that theſe Writers are far from deſerving the Reputation of mere Compilers, by *Edward Milward* M. D. 8vo, *London* 1734.

Oratio Harvæana in ædibus Collegii regalis Medicorum Londinenſium habita Oct. 18. *A. D.* 1735, *ab* E. Wilmot, 8vo, Londin. 1735.

Diſquiſitio Phyſico-medica de natura aquæ & quænam ſit ſaluberrima, à Joanne Baptiſta de Malmedie. *M. D.* 12*mo*, Auguſtæ Eburonum 1735.

Deſcription des Plantes qui naiſſent, ou ſe renouvellent aux environs de Paris, avec leurs uſages dans la medicine & dans les arts, le commencement & le progres de cette ſcience, & l'hiſtoire des perſonnes dont il eſt parlè dans l'ouvrage, par M. Fabregou *Botaniſte & demonſtrateur, Tome* I. 12*mo*, *à* Paris 1734.

A Treatiſe of the foſſil, vegetable and animal Subſtances made Uſe of in Phyſick, containing the Hiſtory and Deſcription of them, with an Account of their ſeveral Virtues and Preparations, by *Stephen Francis Geoffroy* M. D. tranſlated by *George Douglas* M. D. 8vo *London* 1735.

Hiſtoire generale des Drogues ſimples & compoſées, par Pomet: *nouvelle Edition, corrigée & augmentèe, par le Sieur* Pomet *fils, Apothecaire*, 2 *Voll.* 4*to*, *à* Paris 1735.

Mechanica Medicamentorum: Autore Joanne Baptiſta Mazino *Brixiano in Gymnaſio Patavino Med. Pract. Prof.* 4*to*, Brixiæ 1734.

Pilulæ Wardianæ diſſectio & examinatio: Ward's Pill diſſected and examined, and its true Compoſition plainly diſcovered

even

even to ocular Demonſtration. In a *Latin* Epiſtle to the ingenious Dr. *Boerhaave*; now tranſlated into *Engliſh*, 8vo, *London* 1736.

Diſpenſatorium regium Electorale Boruſſo-Brandeburgicum variis obſervationibus locupletatum, ab Erneſto Fagino *Auguſtano, Fol.* Erford. 1734.

Pharmacopœia Collegii regii Medicorum Edinburgenſis. Editio tertia. 8vo, Edinburgi 1735.

Boerhaave's Chemiſtry tranſlated by *Timothy Dallowe* M. D. with ſeveral Corrections and Emendations by the Author's Approbation, 2 Voll. 4to *London* 1735.

Remarques de Chymie touchant la preparation de differentes remedes uſitées dans la pratique de la medecine, 12mo, *à* Paris 1735.

Abregé de l'Anatomie du corps humain, ou l'on donne une deſcription courte & exacte des parties qui le compoſent, avec leurs uſages, par M. Verdier *Chirurgien juré de Paris, 2 Voll.* 12mo, *à* Paris 1734.

Oribaſii *Anatomica ex Galeni Libris, cum verſione Latina* J. Bapt. Raſarii. *Curante* Gulielmo Dundas, *cujus notæ acceſſerunt*, 4to, Lugd. Batav. 1735.

Human Oſteogeny explained in two Lectures, illuſtrated with Figures accurately

drawn from the Life, by *Robert Nisbet* M. D. 8vo, *London* 1736.

Bernardi Siegfried Albini *Anat. & Chir. in Acad. Batava quæ Leidæ est Professoris, Historia musculorum hominis*, 4to, Leidæ Batav. 1734.

Tractatus quatuor Anatomici de aure humana, tribus figurarum tabulis illustrati, Autore Joan. Friderico Cassobhom *M. D. & Prof. P.* 4to, Halæ 1734.

De vasis linguæ salivalibus atque sanguiferis Epistola Christoph. Jacobi Trew *M. D.* 4to, Norimberg. 1734.

Bernard. Siegfried Albinus *Anat. & Chir. P. de arteriis & venis intestinorum hominis; adjecta icon coloribus distincta*, 4to, Leidæ Batav. 1736.

Dissertationes Medicæ de membrana allantoide, Autore Ludovico de Neufville *M. D. De clitoride, Autore* Theodoro Tronchin *M. D. Editio nova emendatior & accuratior*, 8vo, Lugd. B. 1736.

De præcipuis humoribus qui humano in corpore reperiuntur, deque eorum historia, qualitatibus & officiis exercitatio Josephi del Papa *Med. in Pisana Universitate Prof.* 4to, Florent. 1733. *Recus. in* 8vo, Lugd B. 1736.

Fundamenta Physiologica, sive positiones, hominis statum sanum ad officia sibi in

hoc

hoc mundo expediunda neceſſarium, delineantes, Autore D. Detharding *M. D. & Phyſic. P.* 8*vo*, Hafniæ 1735.

Diſſertatio de graviditate debitum geſtationis tempus excedente, ſeu diuturna, Autore Joanne de Buchwald *M. D.* 8*vo*, Hafniæ 1734.

Eſſai phyſique ſur l'oeconomie animale, par François Quelnay *Chirurgien*, 12*mo*, *à* Paris 1736.

Chirurgia Theorico-practica de vulneribus, Autore Petro Guiſard *M. D. Monſpelienſi*, 12*mo*, Avenione 1735.

Chapman's Treatiſe of Midwifery, ſecond Edition with Additions, 8vo, *London* 1735.

A Treatiſe on the immediate Organ of Sight, by *John Taylor* M. D. 8vo, *London* 1735.

A new Treatiſe on the Diſeaſes of the cryſtalline Humour of a human Eye; or, of the Cataract and Glaucoma, by *John Taylor* M. D. 8vo, *London* 1736.

Dr. *Taylor* couch'd for a Cataract: Wherein the Abſurdity of his new Treatiſe on the Diſeaſes of the cryſtalline Humour, as likewiſe his Theory of the Cauſes of Cataracts, is fully demonſtrated, by *J. S.* Surgeon, 8vo, *London* 1736.

L'art de guerir par la Saignée, ou l'on examine en meme tems les autres ſecours

qui

qui doivent concourir avec ce remede, ou qui doivent lui etre preferées dans la cure des maladies tant medicinales que chirurgicales, par François Quesnay *Chirurgien, 12mo, à* Paris 1736.

The Fountain of Health, by *H. Bourdon*, 8vo, *London* 1734.

Elementa diætæ sive regulæ Physico-medicæ ad sanitatem conservandam, vacillantem fulciendam, deperditam verò citò, tutò & jucundè magis recuperandam, Autore K. Detharding *M. D.* Hafniæ 1735.

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A Treatiſe of ſudden Deaths, by *Nicolas Robinſon* M. D. The ſecond Edition, 8vo, *London* 1735.

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De morbis venereis libri ſex: in quibus diſſeritur de origine, propagatione, & contagione horumce affectuum in genere: tum de ſingulorum natura, Aitiologia & Therapeia; cum brevi analyſi & epicriſi operum plerorumque, quæ de eodem argumento ſcripta ſunt. Auctore Joanne Aſtruc *Regi à conſiliis medicis*, &c. 4*to*, Pariſiis 1736.

A new Method of curing (without internal Medicines) that Degree of the venereal Diſeaſe called a Gonorrhæa or Clap, by *George Warren* Surgeon, third Edition, 8vo, *London* 1734.

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Aphrodiſiacus, containing a Summary of ancient Writers on the venereal Diſeaſe, by *Daniel Turner* M. D. 8vo, *London* 1736.

Conſulti Medici del Signor Dottore Giuſeppe del Papa, 2 *Tom.* 4*to*, Venetiis 1734.

Friderici Hoffmanni *conſultationum & reſponſorum medicinalium centuria prima complectens morbos capitis & pectoris*, *Tom.* 1.

Earundem centuria ſecunda, complectens morbos abdominis & artuum externorum, *Tom.* 2. 4*to*, Halæ 1734.

The mechanical Practice of Phyſick. In which the ſpecifick Method is examined and exploded, and the Bellinian Hypotheſis of animal Secretion and muſcular Motion is conſidered and refuted, by *T. Morgan* M. D. 8vo, *London* 1735.

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Phyſ.

Phys. & Med. Prof. Fol. Venetiis 1734.

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L'Histoire & les Memoires de l'Acad. des sciences, Années 1731 & 1732, *4to, à* Paris, *12mo,* Amsterdam.

Commentarii Academiæ scientiarum Imperialis Petropolitanæ, Tom. 4. ad annum 1729, *4to,* Petropoli 1735.

Miscellanea Berolinensia ad incrementum scientiarum, ex scriptis societati regiæ scientiarum exhibitis edita. Continuatio tertia, sive Tom. 4tus, cum figuris & indice materiarum, 4to, Berolini 1734.

Medicorum Silesiacorum Satyræ, quæ varias observationes, casus, experimenta, tentamina ex omni medicinæ ambitu petita exhibent, specimen, 1. *cum figuris,* 8vo, Wratislaviæ & Lipsiæ 1736.

XXXVII. *Books proposed, and other Medical News.*

MR. *Fabregou* promises to publish seven Volumes of his Description of Plants, to which the one mentioned *p.* 502 of this Volume is an Introduction.

There is now in the Press at *Leyden*, *Bernhardi Siegfried Albini Anat. Prof. Ossium fœtus humani icones* 163 *cum earum explicationibus*, 4*to*.

Dr. *Hook*, in his Essay on the Practice of Physick, proposes to publish a new *Pharmacopœia*.

Dr. *Edward Milward* is to favour us very soon with a Treatise on the *Peruvian Bark*, in which he only proposed at first to consider it as a Specifick in Gangrenes, but as we are now informed, he is to examine all its Properties.

A Letter has been published, inviting all the Physicians living or born in *Silesia*, to communicate their Observations, Experiments, &c. any way relating to Physick, which are to be published under this Title, *Medicorum Silesiacorum Satyræ, quæ varias observationes, casus, experimenta, tentamina, ex omni medicinæ ambitu petita exhibent*. We suspect Dr. *Burghart* junior, Physician at *Breslaw*, to be the Collector.

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